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ABSTRACT

The activities in this booklet were designed to provide second grade children with opportunities to explore areas of natural interest to them while gaining knowledge and practice in math skills and with science processes. The lessons are most appropriate for the second half of the school year and are grouped into units on life science, earth-space science, and physical science. Ten mathematics skills and eight science processes are listed and indexed for the 22 activities. Each activity consists of student sheets and a teacher's guide. The teacher's guide contains information on the activities including: (1) topic area; (2) introductory statement; (3) math and science skills; (4) required materials; (5) key questions; (6) background information; (7) management details; (8) instructional procedures; (9) student procedures; (10) discussion questions; (11) activity extensions; and (12) curriculum coordinates. (ML)

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SEASONING MATH & SCIENCE

SPRING & SUMMER

SECOND GRADE

BOOK B

PROJECT AIMS

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Seasoning Math and Science

Book B

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Project AIMS

Project AIMS has as its purpose the integration of subject matter in K-9. Such integration enriches and makes learning meaningful and holistic. Project AIMS began as a program to integrate mathematics and science, but has since developed to also include language arts, social studies, and other disciplines. The acronym "AIMS" stands for "activities to integrate mathematics and science."

Project AIMS is a continuing, non-profit project of Fresno Pacific College. It had its inception in a National Science Foundation funded program to train teachers in the integration of mathematics and science. This quickly created the necessity to write instructional materials incorporating this concept. Despite the fact that thoughtful educators have long recommended this approach, very little appropriate material was available.

Currently, Project AIMS is funded solely through the sale of this developing series of books. All net proceeds from their sale flow into a trust fund administered by Fresno Pacific College. The use of this fund is restricted to the support of continued research and development, partial scholarships for classroom teachers who participate in the writing and field testing teams, and the publication of the books.

Two writing teams have completed their work. The first consisted of seventy-five teachers in grades 5-9 who met over a period of eighteen months. The second involved thirty-five K-4 teachers who wrote during a two-year span. In the fall of 1985 a third team of approximately fifty teachers in grades 2-9 will begin writing. In addition, over a hundred teachers have been involved in field testing newly created materials.

The rationale for this integrative thrust lies in the fact that science, mathematics, language arts, social studies, etc., are integrally interwoven in the real world outside the classroom, from which it follows that they should be similarly treated in the classroom if we are to prepare our students for life in that world. Teachers who have used Project AIMS lessons give enthusiastic endorsement to the effectiveness of this approach.

Science encompasses the art of questioning, investigating, hypothesizing, and discovering. Mathematics is the language that provides clarity, objectivity, and understanding. The language arts provide us with powerful tools of communication. Many of the major contemporary issues involve societal issues stemming from advancements in science. It is time, therefore, that all of us in the teaching profession take seriously using a more holistic mode of transmitting knowledge to students. It is this that motivates all of us who are involved in creating or using the integrative materials of Project AIMS. We invite you to join us in this effort.

Extensive field testing of these materials confirms the following beneficial results.

1. Mathematics becomes more meaningful, hence more useful, when it is applied to situations that interest students.

2. The extent to which science is studied and understood is increased, with a significant economy of time resulting from the integration of two or more disciplines.

3. There is improved quality of learning and retention, supporting the thesis that learning which is meaningful and relevant is more effective.

4. Motivation and involvement are increased dramatically as students investigate real world situations and participate actively in the process.

We invite you to become part of this classroom teacher movement by using an integrated approach and by sharing any suggestions you may have or investigations you would recommend. Project AIMS welcomes you!

Project AIMS Publications

GRADES 5-8 SERIES

Math + Science, A Solution
The Sky's the Limit
From Head to Toe
Fun With Foods
Floaters and Sinkers
Down to Earth
Our Wonderful World
Pieces and Patterns, A Patchwork in Math and Science

GRADES K-4 SERIES

Fall Into Math and Science
Glide Into Winter With Math and Science
Spring Into Math and Science
Seasoning Math and Science, Book A (Fall and Winter)
Seasoning Math and Science, Book B (Spring and Summer)
Jawbreakers and Heartthumpers
Hardhatting in a Geo-World
Popping With Power
Overhead and Underfoot

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Introduction

Primary teachers struggle to include a diversity of subjects into a limited amount of time. The activities in this booklet integrate Math Skills and Science Processes. Incorporating these science and math lessons into the curriculum enables a teacher to use time more efficiently.

Discovery through a hands on experience is exciting, mind opening and motivating. These 22 activities provide an approach which allows second grade children to explore areas of natural interest to them, while gaining knowledge and practice in math skills.

Blowing your top or making paper airplanes are not often considered educational experiences. Children consider playing with gum drops and eating cereal things they would do at home. The investigations included in this series turn such activities into an opportunity for a student to master the skills of estimation, graphing and problem solving.

The second booklet at this grade level includes activities which are most appropriate for the second half of the school year. Included are three main units; Life Science, Earth-Space Science, and Physical Science. The lessons tie into February through April holidays. As writers of these activities we found them to be very enjoyable and successful in our own classrooms. However, feel free to adjust and extend them to meet the needs and interests of your students.

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I HEAR, AND I FORGET

I SEE, AND I REMEMBER

I DO, AND I UNDERSTAND

–Chinese Proverb

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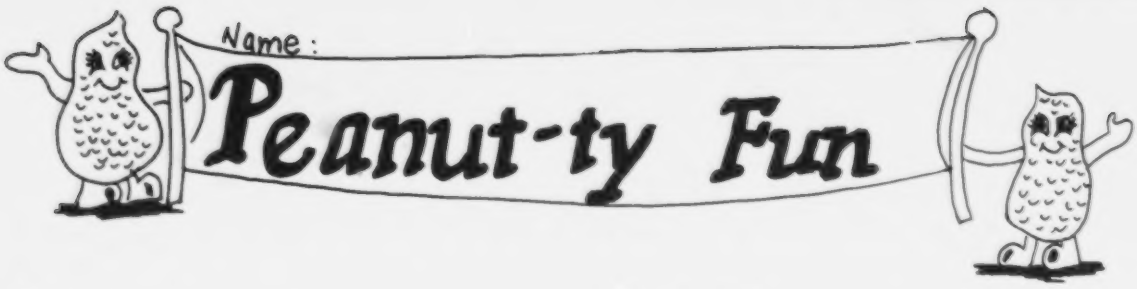

I. **Topic Area**

Measurement and Estimating

II. **Introductory Statement**

Students will estimate and record the number of peanuts, in the shell and out, for a given weight. They will determine how much of the given weight is not edible.

III. **Math Skills**

a. Counting
b. Place Value
c. Weighing
d. Graphing
e. Subtraction

Science Processes

a. Estimating
b. Recording Data
c. Generalizing
d. Comparing

IV. **Materials**

Peanuts in shell-250 grams per group
Scales
Plastic bags
Newsprint or paper towels
Large graph with strips of paper, colored a different color for each group. (patterns on sheet at end of lesson) or,
Transparent graph for overhead projector
Student worksheet
Pencils

V. **Key Question**

How many peanuts do you think are in the 250 grams you weighed?

How many peanuts do you think are in the shells? How much of the weight is peanuts and how much is shells?

VI. **Background Information**

In 250 grams (approx. ½ pound) there will be between 90-110 peanuts. If you wish your class to count fewer peanuts start with less weight.

VII. **Management**

1. This lesson has 3 parts, parts 1 and 2 to be taught as one lesson taking about an hour. Part three is optional and will take about 30 minutes.
2. Counting - each shell shall count as one unit while doing part A of the lesson.
3. Graphing the results
   a. You may graph all three sections if desired, but graph at least one part of this lesson.
   b. On a class graph designate each strip of paper to equal 1 ten. If a group has 96 peanuts, then they have 9 tens and 6 ones and have used 9 strips and .6 of another.
   c. You may make a transparency graph and use an overhead projector.

VIII. **Procedure**

1. How many peanuts are in 250 grams?
   a. Divide the class into small groups (5 or 6 to a group) and assign each group a color.
   b. Have two people from each group weigh out 250 grams of peanuts and put them into a plastic bag.
   c. Each person in the group will estimate how many peanuts are in the bag. Remind the students to estimate the number of shells - not the number of peanuts in the shells. They will record the number on their worksheets two ways: as a whole number and as tens and ones.
   Optional: At this time you might decide to have each child record his/her estimate on a graph.
   d. Discuss counting the peanuts, leading the class to the conclusion that each person can have a turn if they count into groups of ten.
   e. Students count the peanuts and record the amount as a whole number and as tens and ones.
   f. Graph the results on the class graph, explaining that each strip is worth 10. Compare the results between groups. Compare to estimates.
   g. Optional - have the students compare their estimate with the actual amount by using subtraction. Find the lowest difference and announce this as the closest estimate.
2. How many shelled peanuts are inside the shells?
   a. Cover the work areas with paper (newsprint, paper towels, napkins, etc.).
   b. Students estimate and record how many peanuts are in the shells. Optional - graph estimates on large graph.
   c. As students open the peanut shells and count the actual number of shelled peanuts for their group, again remind them about counting in groups of 10. If you are doing part three have groups place peanuts and shells in plastic bags to use the next day.
   d. Record the amount of shelled peanuts on the worksheet.
   e. Graph the results as before.
   f. Optional - Students can compare estimates and actual count through subtraction.
3. How much of the weight is shelled peanuts and how much is shells?
   a. Students will estimate and record how much of the weight is shelled peanut and shell. With younger students you may need to do this as a class. With older students remind them that their two estimates will need to equal the beginning weight.
   b. Students will weigh and record the shelled peanuts.
   c. Students will weigh and record the shells.
   d. Graph the results if desired.
   e. Compare the estimates and the actual weights.
4. Allow the groups to divide the peanuts evenly among themselves to eat.

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X. Discussion

1. How close were you to your estimate?
2. About how many shelled peanuts were in each shell?
   What was the least anyone found?
   What was the most anyone found?
3. Which weighed the most, the shells or the peanuts?

XI. Extensions

1. Older students could figure the ratio of peanuts to shells.
2. Try other nuts to see which gives the most nut compared to shell.
   Which give the least?
3. Cooking with peanuts; peanut butter, peanut soup, peanut brittle, candy, cookies, snacks.
4. Make peanut butter.

XII. Curriculum Co-ordinates

Social Studies

a. Study of George Washington Carver
b. Tie into Black History Week
c. Sharing responsibilities with the group
d. Study of peanuts

Nutrition

Placement of peanuts in the four food groups

Language

a. Oral discussion
b. Write a class experience story
c. Write individual reports

Art

a. Peanut butter collage - children spread peanut butter on bread make a design using other edibles (raisins, sunflower seeds, coconut, your imagination) then eat.

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Name:

Peanut-ty Fun

1. How many peanuts are in 250 grams?

Estimated number:

= tens ones

Actual number:

= tens ones

2. How many shelled peanuts are in shells?

Estimated number:

= tens ones

Actual Number:

= tens ones

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Peanut-ty Fun

Name:

3. How much of the 250 grams was peanuts and how much was shells?

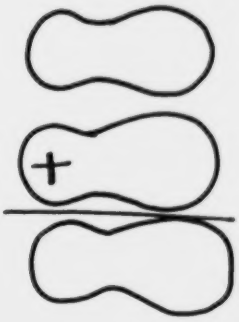
Estimate:

Peanuts

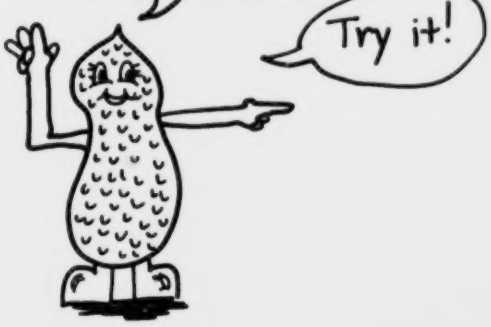
+ Shells

Total 250 grams

Actual:



4. You can compare your estimate with the actual answer by subtracting.



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Peanut-ty Fun Graph Strips

tens ones

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I. Topic Area

Seeds - physical changes through water absorption

II. Introductory Statement

Students will observe and measure changes in seeds when seeds are soaked in water.

III. Math Skills

a. Counting
b. Measurement
   1. Mass(weight)
   2. Linear
c. Geometry
   1. Rectangle
   2. Area
d. Estimating
e. Telling time

Science Processes

a. Observing
b. Recording data
c. Estimating
d. Comparing

IV. Materials

Dried lima beans, 35-40 grams.
1 pt. container for soaking beans
Scales, kitchen or balance with weights
250 ml or 1 cup measuring cup
Water
Strainer
Student page
Crayons

Optional

Laminated or transparent grid for measuring area covered by lima beans.
Other seeds - see Extensions

V. Key Questions

Will seeds change when soaked in water?
How will the seeds change?

VI. Background Information

Vocabulary - rectangle, square, area, grid, grams, centimeters, length, width.

VII. Management

1. This lesson will take two days to complete.
   a. There will be three sessions of 20-30 minutes each.
   b. The first session should be started early in the day; the second session should be approximately four hours later; the third session will be 24 hours after the first session.
2. Use a master grid for placing the lima beans, this could be laminated, or on a transparency for use with an overhead projector. If neither of these are convenient then use copies of the student page.

VIII. Procedure

1. First Lesson
   a. Each child is given a dried bean to observe.
   b. Introductory discussion:
      1. How does this seed feel and look to you?
      2. Will anything happen to these seeds if they are soaked in water?
      3. How will the size or weight change - larger, smaller or not at all?
   c. Weigh the lima beans.
   d. Students lay the lima beans on the master grid (with teacher supervision).
   e. Use numbers on grid to tell length and width of rectangular area on grid covered by the seeds.
   f. Record the data on student sheets.
   g. Students color in grid on their sheets to show area covered.
   h. Students estimate changes, if any, and use a black crayon to outline estimated changes.
   i. Place the lima beans in a container and cover with 250 ml or 1 cup water.
2. Second Lesson (after beans have soaked 4 hours)
   a. Drain water from beans.
   b. Allow children time to observe beans and discuss changes.
      1. Have the beans changed in looks?
      2. How have they changed?
   c. Repeat steps c-i from first lesson. This time use a brown crayon to outline estimated changes.
3. Third Lesson (24 hours after first lesson)
   a. Repeat steps a-b from the second lesson.
   b. Repeat steps c-i from the first lesson.

X. Discussion

Did the seeds change? In what ways did they change?
Do you think other seeds would change in the same way?
How could you find out if other seeds will change?

XI. Extensions

1. Students could try the lesson again using other seeds. (Corn and peas work well).
2. Students could estimate change in weight.
3. Measure the water that is drained off to determine how much has been absorbed by the lima beans.
4. Count the squares in the covered section of grid to determine the area of the rectangle.
5. Use a blank sheet of paper for laying out lima beans and have students measure the length and width of rectangle with a ruler.

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6. Third and fourth grade students could compute the areas of the rectangles.
7. Form the rectangles shown on grid using centimeter cubes. Then re-arrange to form different sized rectangles with the same area.

   Example: A rectangle 12cm x 9cm can also be shown as 9cm x12cm, 4cm x 27cm, 18cm x 6cm, 2cm x 54cm, 36cm x 3cm
8. Students can open the lima beans and find the plant inside.
9. The class can develop word problems using information recorded on student sheets after lesson is completed.

XII. **Curriculum Co-ordinates**

Language Arts

a. Oral discussion
b. Descriptive words
c. Experience stories

P.E.

Pace off different size rectangles on school ground

Social Studies

a. Taking turns
b. Farms

☐ Dry beans

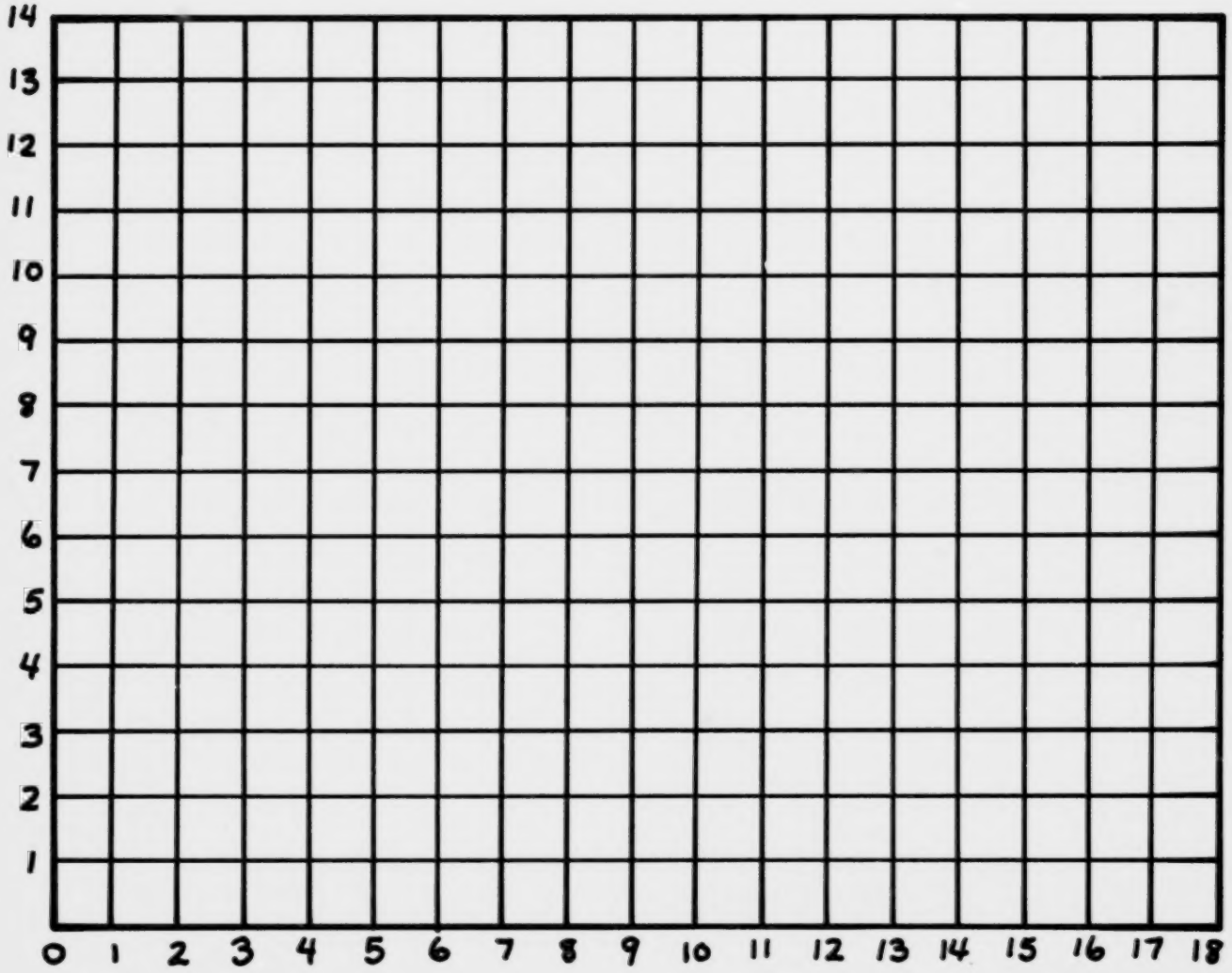
___ gm
___ cm →
___ cm ↑

☐ After 4 hours

___ gm
___ cm →
___ cm ↑

☐ After 24 hours

___ gm
___ cm →
___ cm ↑



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SPROUTING OUT

I. **Topic Area**

Seeds - Sprouting seeds for food

II. **Introductory Statement**

The children will observe the sprouting seeds, noting changes daily.

III. **Math Skills**

a. Weighing
b. Whole number operation
c. Graphing

Science Processes

a. Estimating
b. Recording data
c. Observing

IV. **Materials**

20 grams of seeds to sprout (alfalfa, radish, mungbeans etc.)
Quart jar
8" x 8" square cheesecloth or fiberglass screening (fine mesh)
Rubber band or canning lid rim
Water supply
Scales
Students worksheet

V. **Key Question**

In what ways do you tthink the seeds will change in the next few days?

VI. **Background Information**

To grow sprouts:

1. Soak seeds in water overnight.
2. Rinse seeds twice a day using tepid or cool water.
3. Store sprouts in a dark cupboard while growing. They may be exposed to light on the last day to develop chlorophyll.

VII. **Management**

1. The lesson is best started on Monday and concluded on Friday. If the lesson is started on another day the sprouts should be taken home on the week-end for rinsing.
2. Approximately 20-30 minutes daily will be needed for measuring, recording, and rinsing.
3. This lesson can be taught as a total class lesson. If you want to sprout more than one type of seed divide class into same number of groups as types of seeds. Each group will measure, and record their seeds. Comparisons between seeds can be made as part of the lesson.
4. Seeds for sprouting can be purchased at health food stores. Mung beans are usually available at the grocery stores. Be certain the seeds you use are food seeds. Seeds for gardening may be treated with pesticides.
5. Purchase cheesecloth at a fabric store. It will be a better quality of cheesecloth for use in the lesson.
6. When using the quart jar be certain there is adequate ventilation, especially if the room is warm. Sprouting jars may be purchased at health food or department stores.

VIII. **Procedure**

1. Day One - Afternoon
   a. Students weigh 20 grams of the seeds you are using.
   b. Students weigh the jar, covering, and band; record on worksheet.
   c. Place the seeds in the jar, fill with water, cover jar with cheesecloth or mesh, fasten with rubber band or lid rim.
   d. Students estimate what the weight of seeds will be on day 5.
2. Day Two - Morning

   Teacher pours water off the seeds and rinses well.
3. Day Two - Afternoon
   a. Students weigh jar with seeds and record in appropriate spot on worksheet 2. Subtract the weight of the jar to determine change of weight of seeds.
   b. Record weight of seeds on worksheet 2 and graph.
   c. Students or teacher rinse the seeds well.
4. Days 3, 4, and 5
   a. Every morning rinse seeds well.
   b. Every afternoon follow steps 1, 2, and 3 from day two, afternoon.
   c. On day five eat the sprouts after weighing, recording, graphing, and rinsing.

IX. **Discussion**

1. How did the seeds change in the five days?
2. Which seeds changed the most? In what ways?
3. What have you learned new about growing seeds for food?

X. **Curriculum Co-ordinates**

Health - placement in food groups

Social Studies - grow your own bean sprouts to use in cooking for Chinese New Year

Language Arts - description words, student reports on lesson.

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SPROUTING OUT

Name

_____

Type of seed

Starting weight of seeds 20 grams

Predict the weight of the seeds on Day 5 _____ grams

Weight of jar and covering _____ grams

Weight	Day 2	Day 3	Day 4	Day 5
Weight of jar, covering, and seeds				
Weight of jar and covering				
Weight of seeds				

SPROUTING OUT

Name

Weight of Seeds

Day 1	20 grams
Day 2	____ grams
Day 3	____ grams
Day 4	____ grams
Day 5	____ grams

	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
Day 1																					
Day 2																					
Day 3																					
Day 4																					
Day 5																					
	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200

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RACY RADISHES

I. Topic Area

Cultivating and charting the growth of radishes.

II. Introductory Statement

Students will plant, care for, and harvest radishes and will chart the growth of their plants. Students will compare statistics of their radishes with those planted by other students.

III. Math Skills

a. Measurement
b. Charting
c. Estimating and predicting
d. Fractional numbers
e. Greater and less than

Science Processes

a. Observing and classifying
b. Measuring
c. Estimating
d. Gathering and recording data
e. Comparing

IV. Materials

Potting soil (approximately six quarts for a class of thirty)
Containers for planting (e.g. window box, plastic pots or milk cartons - 1 per student)
Sticks or tape for labeling radishes
1 package radish seeds (1 or 2 seeds per student)
Tray or shallow box in which to set pots
Centimeter and inch measuring tapes and rulers
Access to water
Knife or scissors

V. Key Question

Who can grow a champion radish in 45-60 days?
Can you do something special with your radish to help it win the championship?

VI. Background Information

Basic indoor gardening tips:

1. Keeps plants in a sunny location.
2. Transfer outside on nice days; replace indoors at night.
3. Try placing the entire container in a plastic bag for a "greenhouse" effect.
4. Water lightly when needed - don't soak.
5. Provide drainage for soil - either with holes in the bottom of the container or gravel in the bottom of pot.
6. Allow 45 to 60 days for fully mature growth - but check one or two radishes first before terminating contest.

VII. Management

If using 8 oz. "lunch" milk cartons for containers, wash and set them aside one day, and cut off the tops of the cartons and plant radishes another day.
Prepare for proper drainage - either with holes or gravel.
Loosely pack in soil until carton is nearly full. Scratch the surface of the soil and plant the seeds at a depth of 1/8 inch.
One package of radish seeds contains over 60 seeds.

VIII. Procedure

1. Outline to students the rules of the contest and the champion categories. Post the Rules Sheet in the classroom.
2. Have students save milk cartons from lunch or bring containers from home. Rinse, cut, prepare for drainage; fill with soil.
3. Plant seeds 1/8 inch below the surface. Sprinkle with water. Place in sunny location.
4. Chart the date the radishes were planted; chart the sprouting date for each radish. At two weeks, measure the leaves and chart their height.
5. Harvest at 45 to 60 days, when test radishes are mature. Wash and dry the whole radish, leaves attached. Chart the date picked. Fill out the chart for vital radish statistics:
   a. Length of radish (including leaves)
   b. Length of leaves only (cut from radish)
   c. Circumference of radish
   d. Weight of radish
   e. Number of fully-mature leaves
   f. Find an unusual radish and make note of what makes it special
6. Compare the results and find the champion radishes in each category. Prizes could be:
   a. Red, round ballons with radish theme and smiling faces drawn on with felt pen.
   b. Racy Radish Recognition Certificates (see student sheets).
   c. Radish and other edible seeds sprouting kits (available in the produce department of supermarkets).

X. Discussion

What do plants need in order to grow?
How can we make our plants grow the best?
What do farmers do to grow healthy crops?

XI. Extensions

Use this experiment as a school-wide contest.
Try growing marigolds or other plants in a contest. Select champions for the most blooms, seeds, etc.
Hold a school-wide or classroom "county fair" with harvests, flower-arranging, crafts, displays, etc.

XII. Curriculum Coordinates

Music

Nursery rhymes with gardening theme

Social Studies

History of agriculture; modern farming and irrigation techniques.

Art

Seed mosaics
Draw the name of a fruit or vegetable in its shape; cut it out and mount it.

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RACY RADISHES

(The Great Radish Race)

Rules:

1. Keep charts of vital radish statistics.
2. In 45~60 days, pick all radishes.
3. Wash & dry radishes with leaves attached.
4. Chart the following:

   a. Measure length of radish, including leaf & root.

   b. Weigh radish.

   c. Measure around the largest part of radish.

   d. Measure leaves only.

   e. Count fully mature leaves only.

Prizes for Champions in these areas:

1. Longest radish from leaf-tip to root-tip.
2. Heaviest radish.
3. Largest circumference.
4. Longest leaves.
5. Special radish.

Please Post

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RACY RADISHES

Racy Radishes Name of Student:	Date Sprouted	Height at two weeks cm inches	Length of radish (root + leaves) cm	Weight of radish alone gm	Circumference of radish cm inches	Length of Leaves cm	Number of fully-mature Leaves
27							28

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RACY RADISHES

Room # _____ Teacher _____

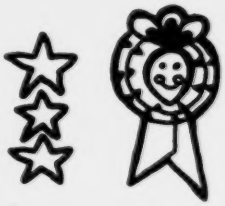
Number of seeds planted _____
Date planted _____
Date picked _____
Number of days from planting to picking _____
What was your gardening method?

_____

_____

_____

Names of CLASSROOM CHAMPIONS



Longest radish ____ cm _____

Longest leaves ____ cm _____

Heaviest radish ____ gm _____

Biggest radish ____ cm _____

Most leaves ____ _____

Most special radish _____
How is it special? _____

_____

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RACY RADISH

Recognition Certificate

presented to

_____

in honor of growing a

Champion Radish

RACY RADISH

Recognition Certificate

presented to

_____

in honor of growing a

Champion Radish

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17

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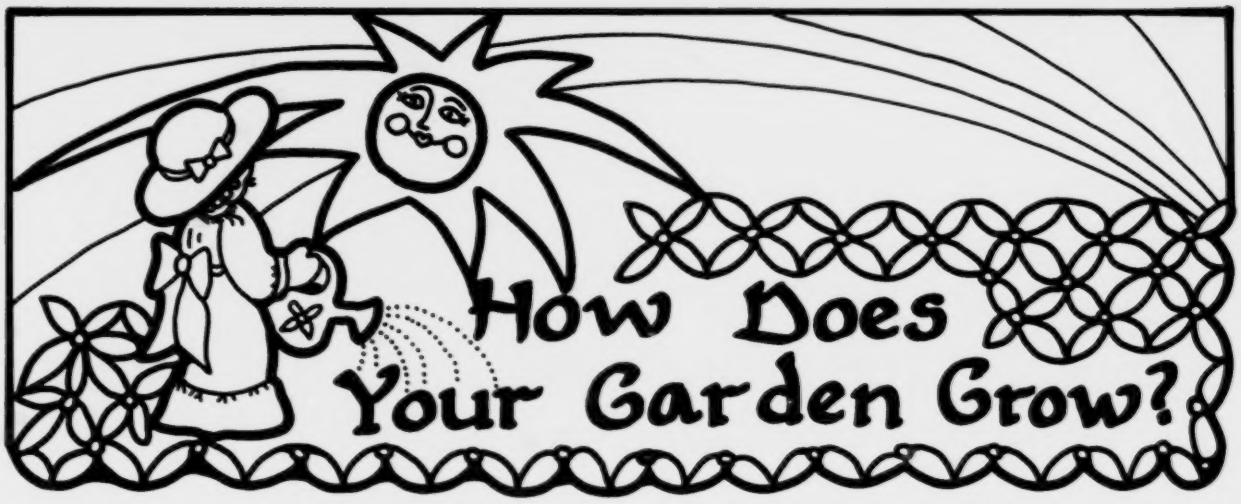

I. **Topic Area**

Plants - growth

II. **Introductory Statement**

Students will observe the growth rates of various plants.

III. **Math Skills**

a. Measurement
b. Computation - used data
c. Graphing

Science Processes

a. Observing
b. Collecting/recording data

IV. **Materials**

Seeds - a variety
Soil
Planters - two or three large planters or individual planters for each child
Student page

V. **Key Question**

How fast will different seeds sprout and grow?

VII. **Management**

1. This lesson will take at least three (3) weeks to complete.
2. The first lesson will vary in length depending on if each child plants their own seeds or if two or three types of seeds are planted for the whole class to observe.
3. You can save time by having the soil in the planters before classtime.
4. If available, peat pots are excellent as individual planters.
5. Time should be allowed for observation each day; as plants sprout record the date.
6. At least once a week plant growth should be measured and recorded.
7. Dates of sprouting and measurements of plants may be kept on a large chart or each child may keep records on their student page.

VIII. **Procedure**

1. Introductory discussion
   a. What do seeds need for growing?
   b. Do all seeds and plants grow at the same rate?
   c. How fast will these different seeds sprout and grow?
2. Planting the seeds - (Method 1 - a few for class observation)
   a. Using as many planters as there are types of seeds, the teacher or a few students will plant 8-10 seeds in each planter and label the planters.
   b. The students will record the names of the seeds and the date on their student page.
3. Planting the seeds - (Method 2 - each student plants own seeds)
   a. The children will fill their planters with soil.
   b. Each child will choose 2 plants (1 vegetable, 1 flower)
   c. The student will plant 3-4 seeds in each planter and label.
   d. The students will record the names of the seeds and the date on their student worksheet.
4. As seeds sprout the students will record the dates on the student worksheet.
5. Once a week, or more often if you wish, measure the plants. If children have planted their own seeds, each student will measure their own.

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6. Students will record the growth of the plant on the graph and write the date. (See the example.) Use a different color for each measurement. Write the date next to the highest square colored for each plant.

7. Optional - students will develop their own work problems using the data collected.

X. **Discussion**

1. Which seeds sprouted first? Which seeds sprouted last?
2. Which plant is the tallest? Which plant is the shortest?
3. Did all the plants grow at the same rate of speed?
4. Did the plant that sprouted first grow the tallest?

XI. **Curriculum Co-ordinates**

Language Arts

1. Experience stories
2. "If I were a plant I would be a ————————————————, because . . ."

Art

Make a mural showing the stages of plant growth.
Draw plants or flowers with faces.

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DAISY DAYS

I. **Topic Area**

Plants: The stem's "job"; coloring flowers

II. **Introductory Statement**

Learners will observe that a plant sends water and nutrients to the flower through the stem.

Students will discover which color and how many drops of vegetable dye will most effectively tint the flower.

III. **Math Skills**

a. Counting
b. Graphing
c. Estimating
d. Predicting
e. Measuring

Science Processes

a. Observing
b. Estimating
c. Controlling Variables
d. Applying and Generalizing
e. Gathering and Recording data

IV. **Materials**

12 white "Esther Reed" daisies or other white flowers - Carnation, Marguarite, etc.
12-12oz. paper cups or jars
Vegetable Dye (red, green, yellow, blue)
Sharp Scissors or Knife
Colored Pencils or Pointed Crayons (1 set per Student)
1/3 Cup Measurer
1 Magnifying Glass or more if available

V. **Key Questions**

Why do some flowers wilt after we pick them?
What will happen if we put a white flower into colored water?
Will it make a difference how many drops of dye we add to the water?
Will the color added to the water make a difference?

VI. **Background Information**

1. A plant takes in water through its roots or through a cut stem. If a plant is deprived of water, it will wilt. Water in the plant tissues keeps the plant stiff. The dye will enable students to observe the accumulation of water as it is sent first to the tips of the flower petals, and then gives the flower an overall tint.

VII. **Management**

1. Set up before beginning this investigation:
   a. Cut stems of flowers at an angle with a sharp knife or scissors, measuring from the bottom of the blossom down seven inches.
   b. Set out containers and other materials. Label each container with the color of dye to be added and the number of drops of the coloring. Example: Label three containers - "Red-4", "Red-6", "Red-8". Continue this procedure labeling three green, blue and yellow containers.
2. Begin the experiment first thing in the morning as water moves slowly through the stem.
3. Be prepared to discuss and chart progress at regular intervals during the day and once the following morning.
4. Caution: Food coloring stains!
5. Class time: 15-20 minutes for initial experiment; 5-15 minutes each time flowers are checked and data is recorded.

VIII. **Procedure**

1. Introduction:
   a. Discuss a plant's needs for healthy growth - sun, soil, water, air, etc.
   b. Discuss objective and key questions.
2. Activity:
   a. Measure 1/3 cup water into each container.
   b. To the container labeled "Red-4" add four drops of red food coloring; to "Red-6" add six drops; to "Red-8" add eight drops.
   c. Continue this procedure for the remaining colors.
   d. Place one flower, stem cut, into each container.
   e. Post time on the chalkboard.
   f. Distribute student worksheets. Assign a group of students to observe each color of dye. Students will fill in color key on sheet to match the color of dye they're observing.
3. Check and chart:
   a. After one hour, check each flower with the magnifying glass for any changes.
   b. Students will draw changes in appropriate place on chart, using corresponding color of pencil or sharp crayon. (You may wish to model a master chart on the overhead projector as an example.)
   c. Check again after two, three and four hours and the first thing the following morning. Enjoy the colorful changes in your room!

X. **Discussion**

How much time passed before we noticed a change in the flower?
How does the colored water move from the container into the flower?

XI. **Extensions**

1. Slice a six-inch stem up the middle two or three inches. Take two vases, each with one inch of water. Add green dye to one vase, red to the other. Place one half of the split stem into each vase. Each side of the flower will turn a different color.
2. Try an experiment in which stalks of celery are placed in dyed water and in other liquids, such as oil, salt water, detergent, etc.
3. Experiment with flowers of different stem lengths, using the amount of food coloring and the color of vegetable dye you found gave the best result.

XII. **Curriculum Co-ordinates**

Language Arts

Write a story about the experiment.

Music

"Bicycle Built for Two"

Social Studies

Is the daisy a state flower? What is our state flower?

Art

Flower arranging.
Draw a picture of the flowers.
Make daisy chains.

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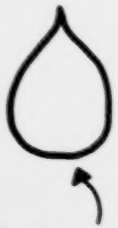
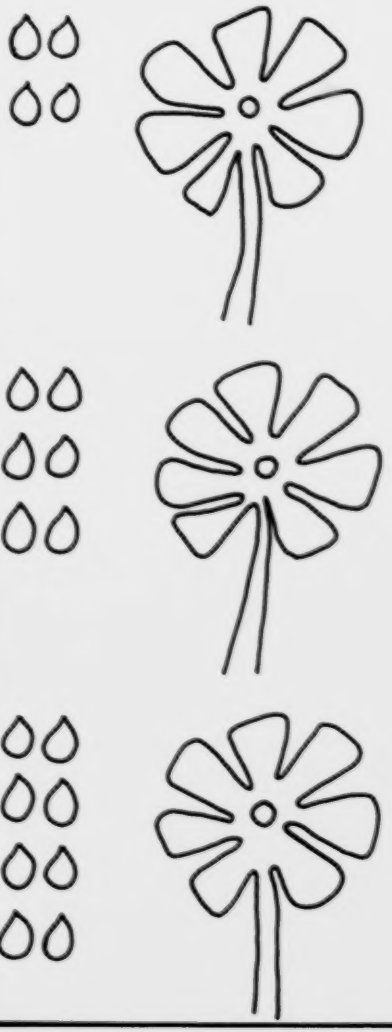
DAISY DAYS

Name: _____

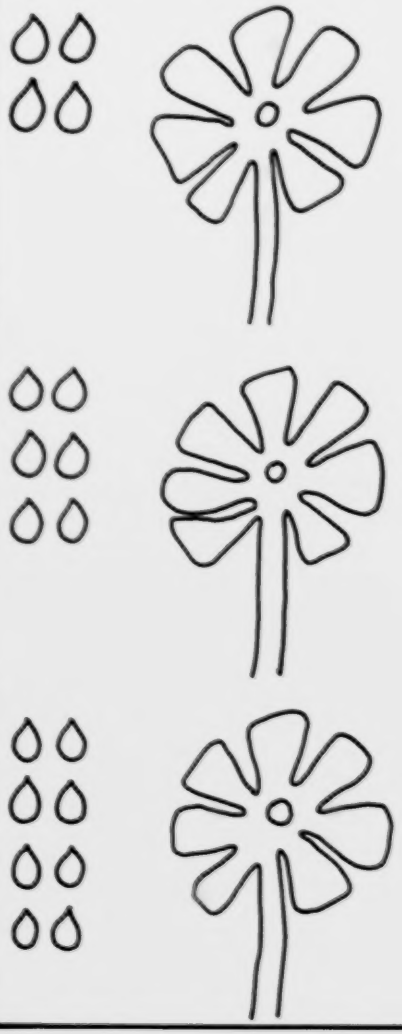


Color of Dye

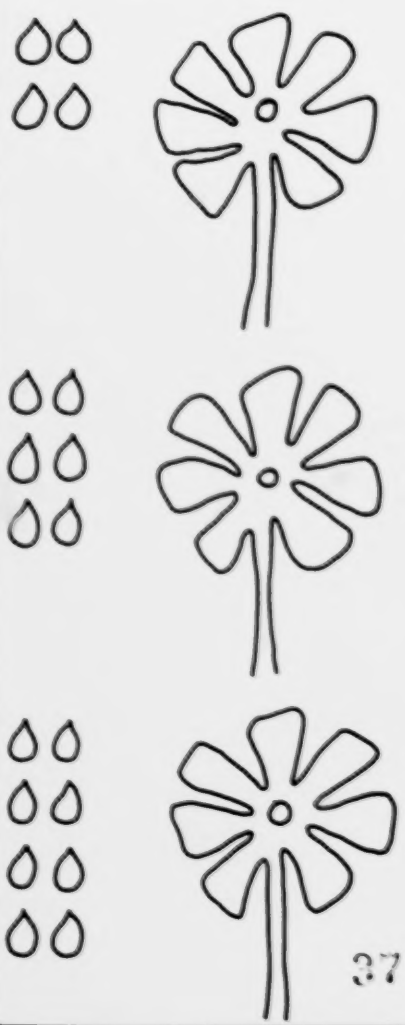
2 hours



4 hours



24 hours



Creepy Crawlers

I. **Topic Area**

Insects (Bugs)

II. **Introductory Statement**

Students will count and compare insects in the shade and in the sun.

III. **Math Skills**

a. Counting
b. Graphing

Science Processes

a. Recording data
b. Observing
c. Comparing

IV. **Materials**

Tape
Pencil
Scissors
Student pages
Crayons 4 or 5 colors
Roll of butcher paper

V. **Key Questions**

Where would you be able to find the most insects in our school year?

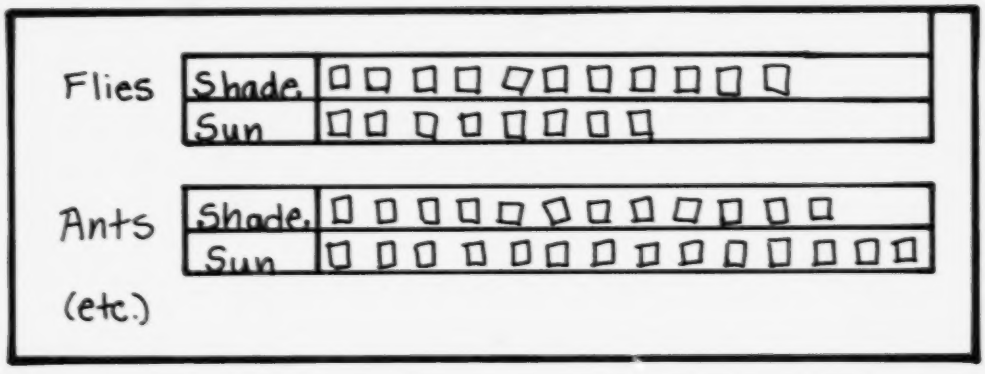
Do you think you'd find more insects in the sun or in the shade? Why?

VII. **Management**

1. Work may be done as a total class activity. Students may work in partners.
2. Allow thirty minutes for discussion and predictions in the classroom; students will need about twenty minutes for outside observations.
3. The observations may be repeated at different times during the day, also in the morning and afternoon.
4. The observations should be in different locations, i.e. grass, dirt, blacktop, cement, flowerbed, etc.
5. Do this lesson on a sunny and calm (not windy) day.
6. Each student will need both "Sunny Spot" and "Shady Spot" Creepy Crawlers Graph pages.

VIII. **Procedure**

1. Discuss with class the insects (bugs) they think they will see in the yard. Have students predict how many they think they will see of each kind in the sun and shade and record on Creepy Crawlers Tally Sheet. Discuss tally procedure to be used when observing insects (bugs) outside.
2. Students cut out frame. (Student Worksheet 2).
3. The students will select a spot in the shade, place their frame on the ground and tally the insects (bugs) they see in the frame. They may do this activity three times or stop after five or ten minutes.
4. Repeat Step 3 in the sun.
5. Upon returning to the classroom, students will complete individual Creepy Crawler Graphs--one for sunny area and one for shady area. Establish a color code, for the class to follow, i.e. ants-red, flies-blue etc.
6. Students will fill in their graphs according to the color code to show how many of each type of insect they found.
7. Discuss the graphs and the findings.
8. Make a class graph of ants, flies, etc. Use small squares of colored construction paper or adhesive stickers on butcher paper as shown below.



Example of Creepy Crawlers Class Graph

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9. Repeat steps 5 and 6 with observations made in the sunny area.
10. Optional: Students will fill in descriptions, types and numbers of insects, etc. on student worksheet 4.

X. Discussion

1. Where did you find the most insects (bugs)? Why?
2. Were some of the insects (bugs) found in both the shade and sun? Why or why not?
3. Which insect did you find the most of in the shade? In the sun?

XI. Extensions

1. Go to the same areas a week or two later, and see if there are more, or less insects--check again a month later.
2. Do these activities in different seasons.
3. Do an insect count on the walls of three different buildings.
4. Put up Fly Paper in 3 or 4 different buildings.
5. Use a magnifying glass to examine the insects that the students found.
6. Start an insect collection, and classify the insects.
7. Students choose their own area outside of school to check insects (bugs).

XII. Curriculum Coordinates

Language Arts

Write a story describing an insect you found and draw it with your story.
Have an ant colony and write what ants do.
Read a variety of insect stories and poems to your class.

Art

Make lady bugs out of egg cartons
Make butterflies out of wax paper, crayon chips and construction paper, and iron at low heat.

Music

"The Old Lady Who Swallowed A Fly"
"The Eency, Weency Spider Went Up the Water Spout"

Social Studies

Compare countries and states for the most insects and the fewest insects.

Geography

What states have fire flies (lightning bugs)?

Poems

"Firefly" by Elizabeth Madox Roberts
"Going Barefoot" by Aileen Fisher
"Mosquito to Music" by Anne Blischke

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Creepy Crawlers Tally Sheet

INSECT	Shaded Area		Sunny Area	
	Predict ?	Tally	Predict ?	Tally
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

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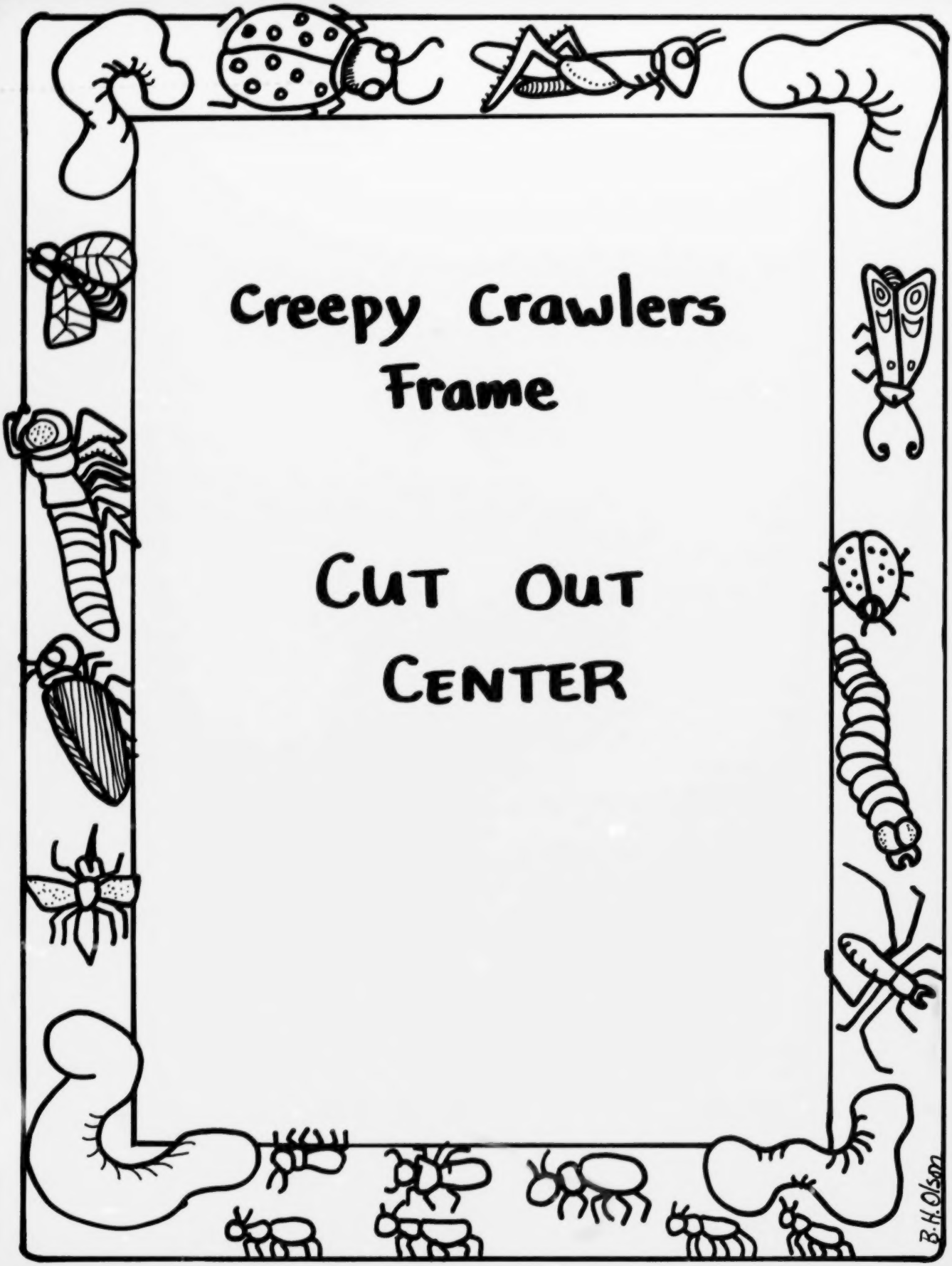

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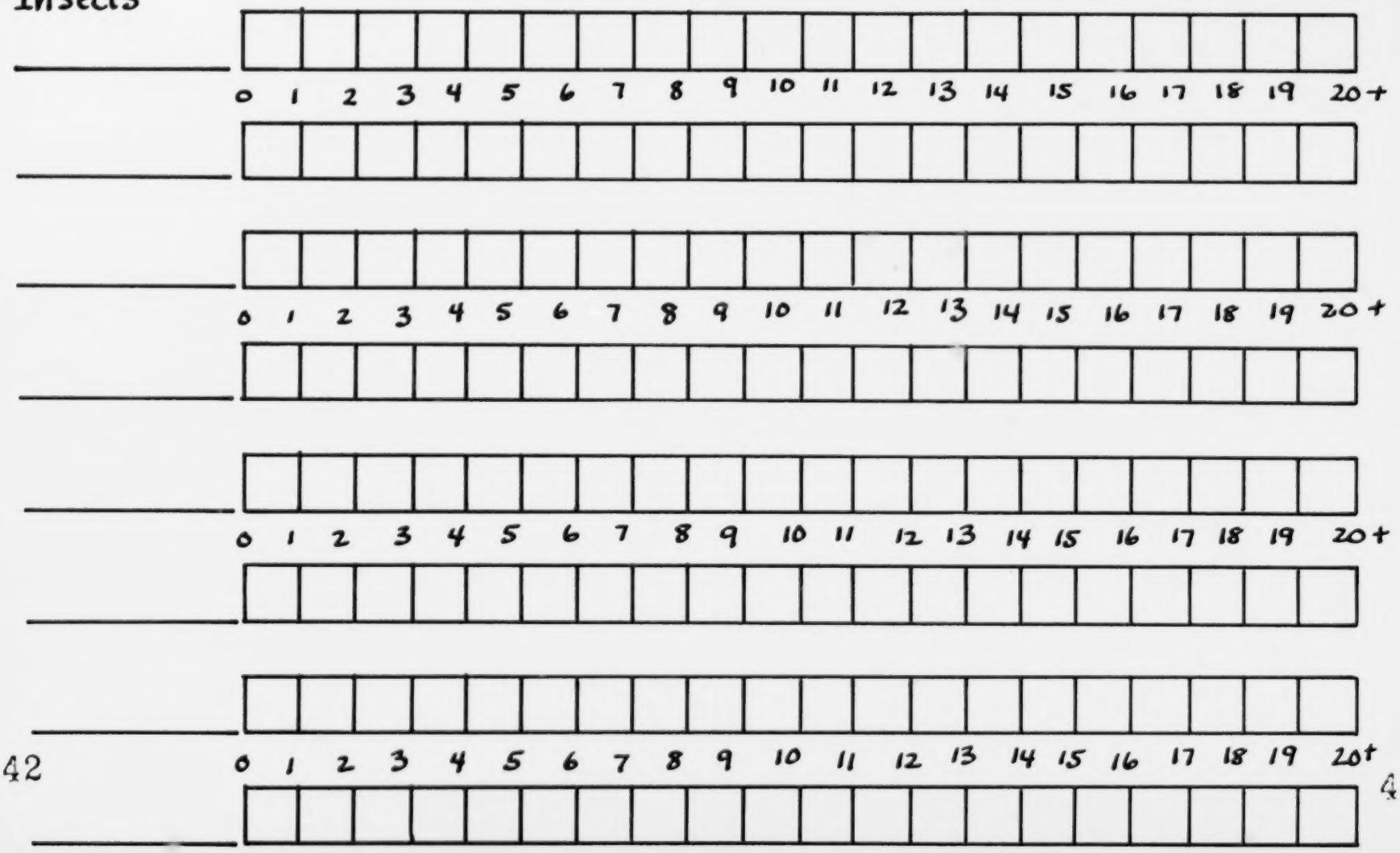
Creepy Crawlers Graph

Name: _____

Insects



Seasoning Math and Science, Book B

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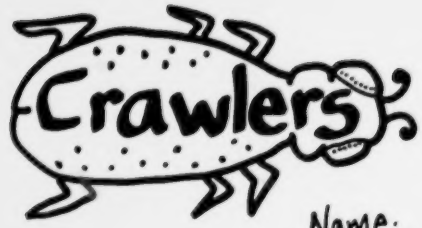
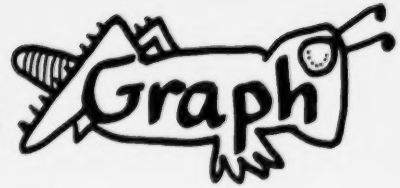
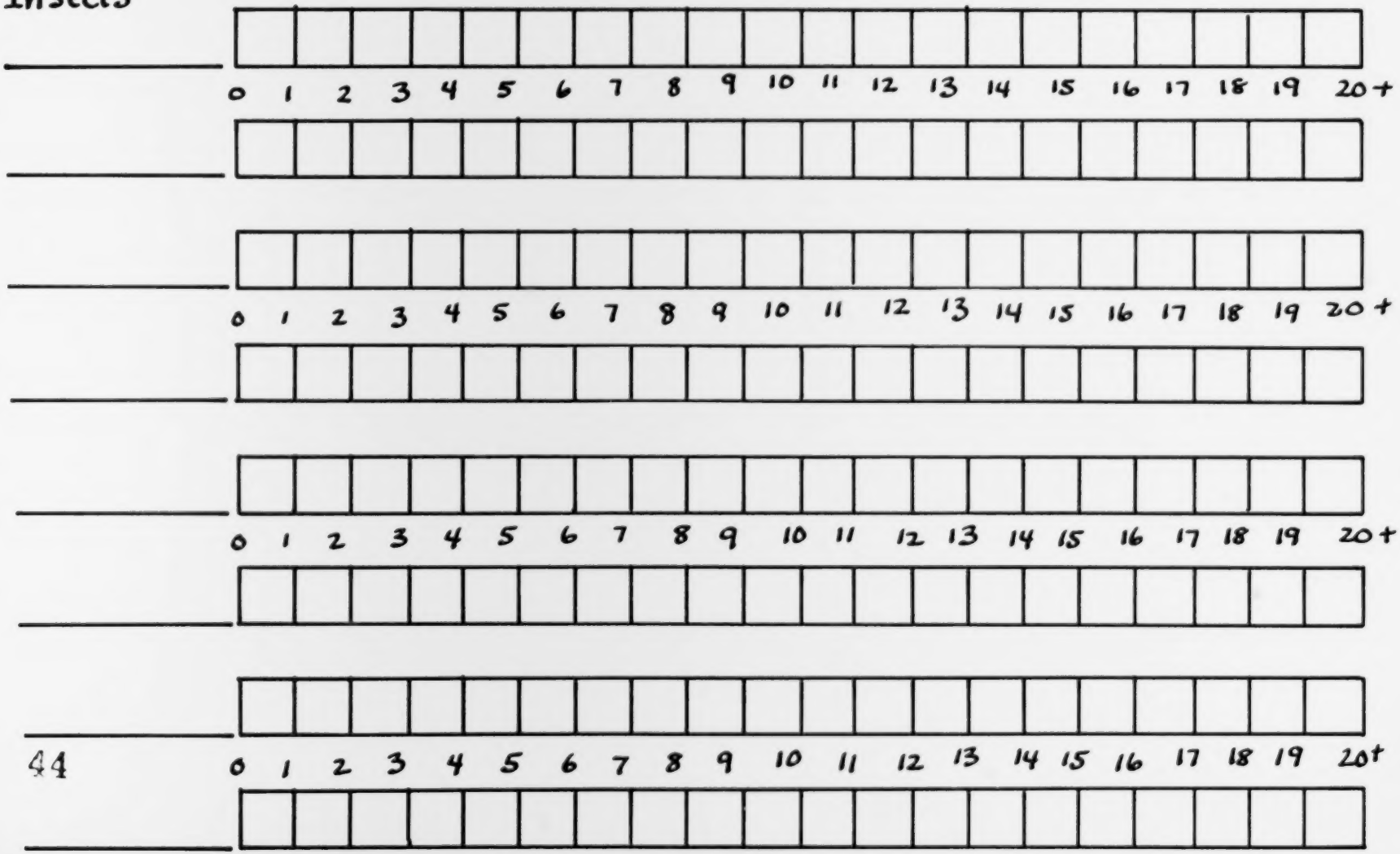
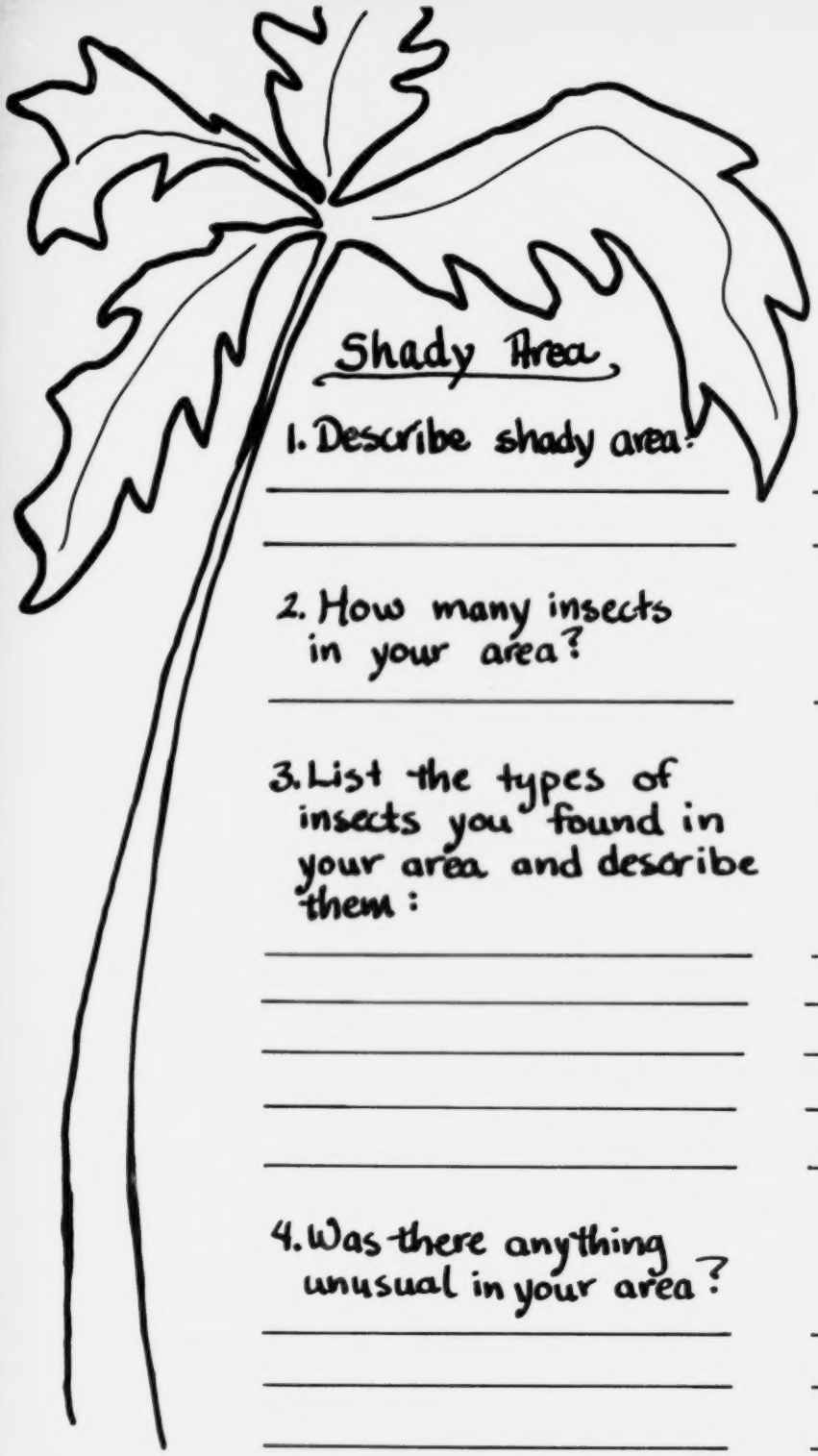


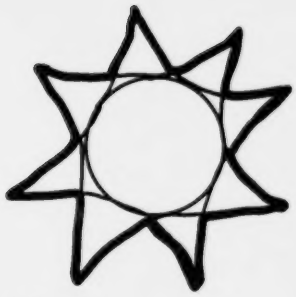


Name: _____

Insects







Shady Area

1. Describe shady area:

2. How many insects in your area?

3. List the types of insects you found in your area and describe them:

4. Was there anything unusual in your area?

5. Was there a tree in your area? _____
How could that affect the bug count?

Sunny Area

1. Describe sunny area:

2. How many insects in your area?

3. List the types of insects you found in your area and describe them:

4. Was there anything unusual in your area?

5. Was there a tree in your area? _____
How could that affect the bug count?

I. **Topic Area**

Dinosaurs

II. **Introductory Statement**

The students will predict the length and height of a dinosaur and then measure its actual size.

III. **Math Skills**

a. Estimating and Predicting
b. Counting
c. Measuring
d. Graphing

Science Processes

a. Observing
b. Recording data
c. Comparing

IV. **Materials**

20 to 30 students
Chalk
One playground
Pencils, crayons
Student worksheet
Pictures of dinosaurs
One piece of plain, white paper for each student
One meter stick

V. **Key Question**

How many students lying down "head-to-foot" do you think will add up to make the length of a Brontosaurus Dinosaur?

VI. **Background Information**

1. The Brontosaurus had a long, thin neck and a tiny head.
2. Its legs were the size of thick tree trunks, and it had a very long tail.
3. It was amphibious, living both on land and in water.
4. It had a very small brain.
5. It walked on all four feet, and ate plants.

The Mesozoic era began 200 million years ago, and it lasted for about 140 million years. This era was called the Age of Reptiles. Many land and water changes took place in this era. During this period the reptiles flourished and became highly specialized. The most well-known of these reptiles were the huge dinosaurs. The word dinosaur means "terrible lizard."

There were many kinds of reptiles that lived on land, in the oceans, and in the air. Some were very large, and other were quite small. Some ate only plants, and others ate flesh.

Brontosaurus 20m (65 ft.) by 5m (15 ft.)
Apatosaurus 23m (75 ft.) by 5m (15 ft.)
Ankylosaurus 5.2m (17 ft.) by 1.5m (4 ft.)
Ornitholestes 1.8m (6 ft.) by 1.6m (5 ft.)
Allosaurus 10.7m (35 ft.) by 5m (15 ft.)
Styracosaurus 5.5m (18 ft.) by 1.8m (6 ft.)
Tyrannosaurus 14.4m (47 ft.) by 5.8m (18½ ft.)

VII. **Management**

1. This investigation may be divided into two, forty minute segments.
2. This activity should be done before it gets too warm, to avoid the discomforts of lying on the hot blacktop.
3. This activity may be used as an entire class or small group activity.

VIII. **Procedure**

First Day

1. The students are given a plain piece of drawing paper.
2. The teacher explains that the students must listen very carefully to everything that is said. The teacher reads a brief description of the Brontosaurus, as outlined in the background information numbered 1-5.
3. After each description is given one at a time, the students are asked to draw accordingly. Once the information is given to the students, ample time is provided for the students to fill in the missing parts that were not detailed by the teacher.
4. After completing the drawing with pencil, the students should color their dinosaurs.
5. Encourage the students to share their drawings with the other members of the class.
6. At this time, the teacher should provide study prints or pictures of a Brontosaurus and have students discuss their drawings and compare the similarities and differences.
7. Display drawings on a class bulletin board.

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Second Day

1. Beforehand, the teacher marks the length of twenty meters and height of five meters, chalking these reference points on the playground.
2. While still in the classroom, have students estimate how many children lying "head-to-foot" it will take to make the length of a Brontosaurus.
3. After the students record their predictions, they go outside to the blacktop area and start lying down "head-to-toe", one at a time.
4. The students should remain lying down until the twenty meters has been reached with bodies. (If there are not enough students to complete this investigation, students from the front of the line can get up from their place to continue further on down the line, to complete the twenty meters.)
5. The students will then orally count off how many student's bodies make up the entire length of a Brontosaurus.
6. After the students finish counting off, they stand and are given the opportunity to record the actual measurement.
7. The students then calculate the difference from their estimations and actual measurements.
8. This procedure will be repeated to find the height of the Brontosaurus.
9. Once both the length and height have been marked with student bodies children may assist the teacher in drawing the shape of the dinosaur on the playground with chalk. It might be helpful to have four students stand on the chalk marks to provide reference points.

IX. What Student Will Do

Included in procedures

X. Discussion

1. Do you think that if we repeated this investigation using different students the same age, our results would be the same? Why? Why not?
2. Can you devise your own standard of measurement and repeat this activity? How would your results differ? Be the same?

XI. Extensions

1. Have students measure other dinosaurs: Apatosaurus, Ankylosaurus, Ornitholestes, Allosaurus, Styracosaurus, Tyrannosaurus, Stegosaurus.
2. Calculate how many students when weighed together total the weight of a Brontosaurus if it weighed 30 tons (60,000 pounds).

XII. Curriculum Co-ordinates

Art

Encourage the students to build their own dinosaurs using various sizes of boxes. Jello boxes, toothpaste, cereal, hand-cream and film boxes are perfect to use. Once the students have constructed their dinosaur, have them paste a layer of paper over the entire dinosaur and let it dry. Then they will be able to paint it with bright tempera paint. If you choose not to cover it with paper, a few drops of detergent added to the tempera will help the paint to stick.

Make clay dinosaurs and place them in the proper setting--a shoebox diorama.

Make paper mache dinosaurs using coat hanger frames.

Language Arts

Have students create and name an original dinosaur. Write a description of this "new friend".

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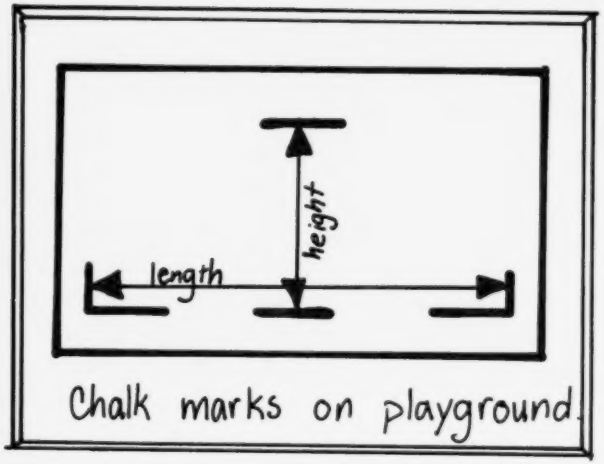
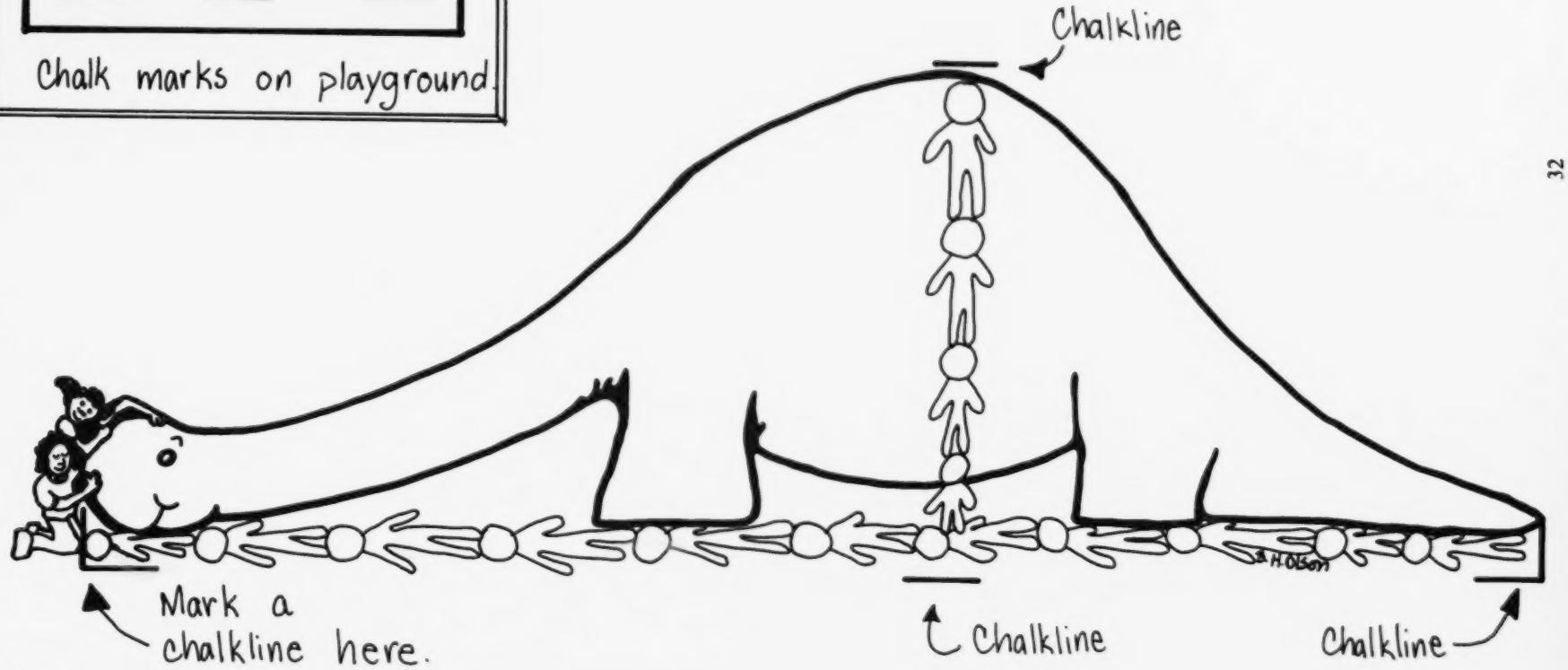
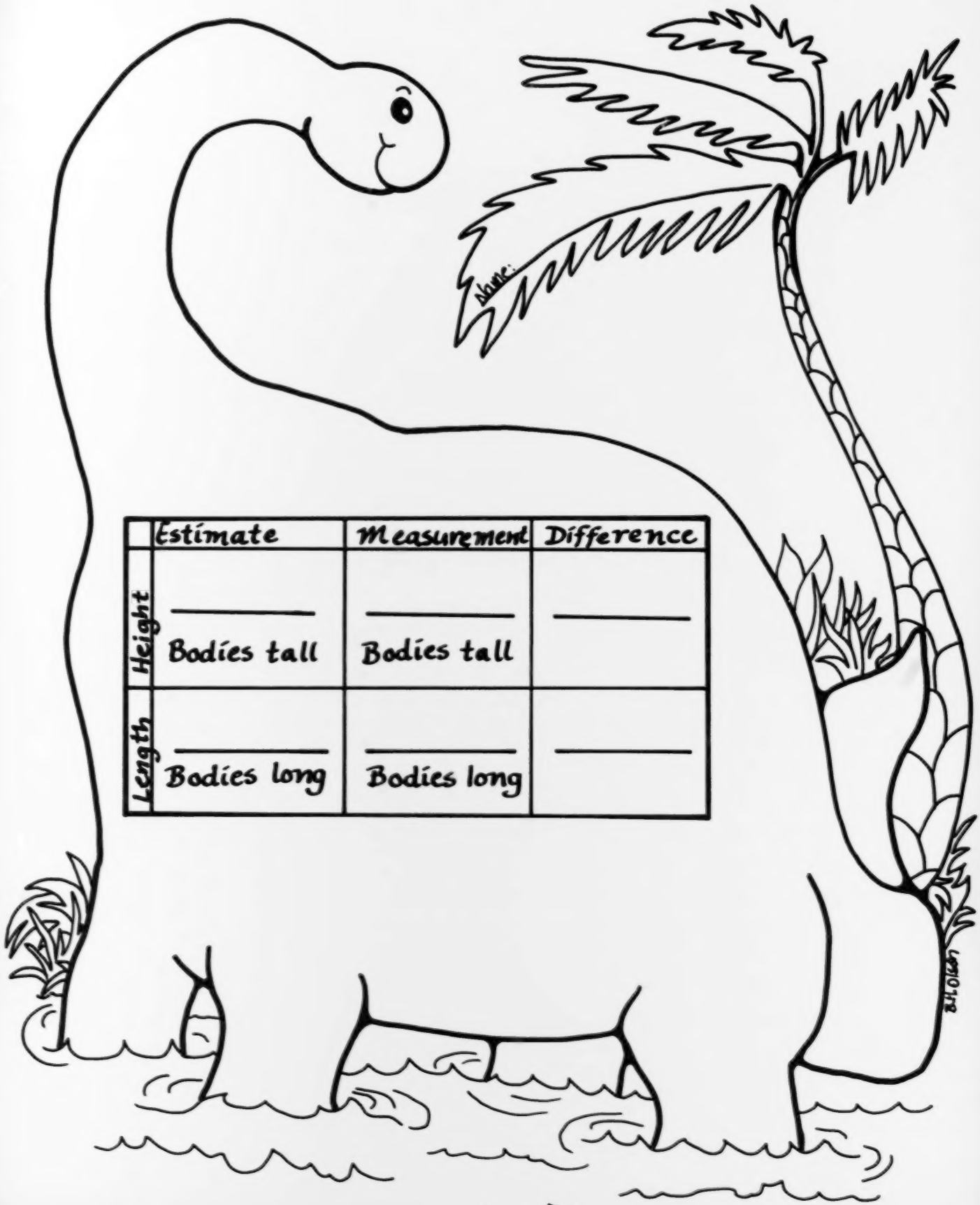
How Many Bodies Fit on Your "Body"Saurus?







	Estimate	Measurement	Difference
Height	_____ Bodies tall	_____ Bodies tall	_____
Length	_____ Bodies long	_____ Bodies long	_____

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SMOOTH SAILING

I. Topic Area

Surface Tension

II. Introductory Statement

The student will discover how the change in surface tension creates movement.

III. Math Skills

a. Measuring (time)
b. Geometry
c. Whole number computation

Science Processes

a. Observing
b. Recording data
c. Comparing

IV. Materials

One rectangular shaped aluminum pan for every two students (8x12 or larger) filled with ½ inch of water.
One eyedropper for every two students.
One stopwatch for every two students or a visible clock with a second hand.
Pepper
Cool tap water
Liquid dish-washing detergent
One styrofoam lid or piece of tagboard for every two students to make boats.

V. Key Questions

How do you think we can get the boat to cross to the other side of the "lake"?
What shape of boat would travel the best?

VI. Background Information

Water is a polar atom formed by oxygen and hydrogen. A polar atom is one that has a positive charge on one end and a negative charge on the other. Since opposites attract, the poles on one molecule of water are attracted to the poles of another. This attraction holds the water together like a net. This is called surface tension. When detergent touches water it becomes attached by the polar bonds to the water molecules. This breaks the net up where the detergent is touching and water bulges up from below. This causes a slight wake on which the boat crosses the small "lake". The pepper shows the line where the wake is forming.

VII. Management

1. This activity works best when students work in pairs.
2. Beforehand, the teacher should fill each eyedropper with liquid dish-washing detergent.
3. The timing should stop when the boat comes to a complete halt, or hits the edge of the lake.
4. If the student tries this activity a second time, the lake must be thoroughly cleaned out so no traces of detergent are left from before.

VIII. Procedure

1. Fill the aluminum pan with ½ inch of cool tap water.
2. Sprinkle pepper onto the water.
3. Students choose a shape from the student worksheet, cut a boat out of tagboard or styrofoam and place it at the end of the lake.
4. Have one student hold the eyedropper with the detergent above the notch in the boat's stern. (The stern is the back of the boat.)
5. When the student timing the boat says "Go!" The second student places one drop of detergent at the stern of the boat.
6. Have the students record the time it took the boat to cross the "lake", and come to a complete stop.
7. Have students compare their results with three friends and record their results, finding the differences.

X. Discussion

1. Did you get the same results as your friends? Why do you think you did? Why do you think you did not?
2. What might you do to make the boat go faster?

XI. Extensions

1. Have the students try this investigation once again using different depths and temperatures of water. What are the results?
2. Have the students repeat this investigation using different shapes of boats.

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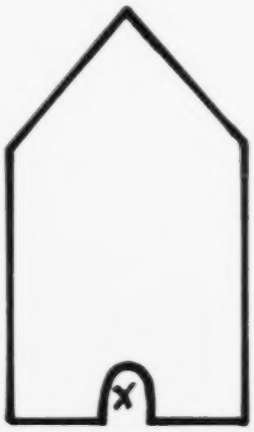
Name:

SMOOTH SAILING

My Friend's Name	My Time	My Friend's Time	Difference
①			
②			
③			

1. Choose a boat shape.
2. Put it over your styrofoam.
3. Trace the outline with your pencil.
4. Cut out the boat.
5. Punch a hole at the "x".



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SAIL AWAY...

I. **Topic Area**

Boat movement-paddle wheel and jet propulsion.

II. **Introductory Statement**

Students will construct a jet and a paddle wheel boat, and compare their efficiency.

III. **Math Skills**

a. Measuring distance
b. Estimating
c. Graphing

Science Processes

a. Recording data
b. Observing
C. Comparing

IV. **Materials**

For Each Student

Student pages
Crayons-2 colors
2 toothpicks
1 milk container-half gallon or quart
1 rubber band
1 balloon-long size

Teacher

Stapler
Scotch tape
Scissors
2 or more tape measures-metric
Sharp knife, ice pick, or nail, hammer
Wading pool or large container

V. **Key Questions**

What are some ways to propel a boat?
Which way is best?

VII. **Management**

1. This activity will take about 3 hours, or 3 one hour periods.
2. This activity may be used with the whole class or in small groups.
3. Teacher may need to cut the milk cartons and punch the holes before the lesson (see procedure) as the ends of the milk carton are difficult to cut and may cause a hazard and waste time.
4. Save the top part of the milk carton for the paddle wheel and the holder.
5. A large pool of water will be needed for this experiment. Use a wading pool or visit a nearby swimming pool, or construct a man made lake. To construct a lake either build a frame out of 2 x 4's that is 6 feet long and 2 feet wide or dig a trough in the local sand box and line the frame or sand box with a plastic sheet and fill with water.
6. Attach measurement device on both sides of the pool with tape.
7. Step 1-Construct the jet boat and complete experiment.
   Step 2-Construct the paddle wheel and complete experiment.
   Step 3-Compare the results of the experiments.

VIII. **Procedure**

Step 1

1. Construct balloon boat following the steps below:
   a . Cut milk carton in half the long way. Save the remaining half of the carton. Note: Cut in half so the point of the carton remains to form the front. (Bow) of the boat as in the diagram.
   b . Using a nail or other sharp implement, punch a hole in the back (Stern) of the boat as near to the bottom as possible.
   c . Pull the balloon's opening through the hole.
2. When students have completed their boat, they predict how far their boats will go with 5, 10, and 20 puffs of air in the balloon. They will graph this prediction using a color crayon.
3. Students will blow five puffs into the balloon that is in his/her boat and release the boat at edge of pool. Measure and record distance boat moved. Repeat with 10 and 20 puffs.
4. Teacher or students may record measurements on a large class chart.

Step 2

1. Change the balloon boat to a paddle wheel boat following the steps below:
   a. Cut the leftover portion of the milk carton in half for the paddle wheel and the extension to hold it.
   b. Cut out top of half for paddle wheels and cut into 2 pieces the same size.
   c . Staple the 2 pieces together in the middle and fold away from each other to look like an "x".
   d. Punch a low hole in each side of the extension.
   e. Cut up on back end of holder to prevent drag in water.
   f. Push rubber band through each hole with a toothpick and slip toothpick through rubber band on outside of each extension and staple holder twice to each side of the back of the boat.
   g. Put paddle wheel into the rubber band so that the rubber band is on the top and bottom of the staple.
2. Repeat steps 1-5 for the paddle boat experiment using 5, 10 and 20 winds of paddle wheel. Be sure to wind paddle wheel backwards for boat to go forward.

Step 3

1. Students will compare the distances for the different boats.

X. **Discussion**

1. Does a boat move faster with a balloon or a paddle wheel?
2. Does a boat move further with a balloon or a paddle wheel?
3. How could we improve our boat to make it move faster?

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XI. Extensions

1. Improve on boats to get a better distance - such as change paddle wheel size, and add more balloons. Try racing balloon and paddle wheel at the same time.
2. Students compare paddle wheel and jet boat in boat races to see which boat went the greatest distance, and graph.
3. Try the paddle wheel on either side of the boat instead of the back, by changing the extension to one or the other side, or try both sides.

XII. Curriculum Coordinates

Art

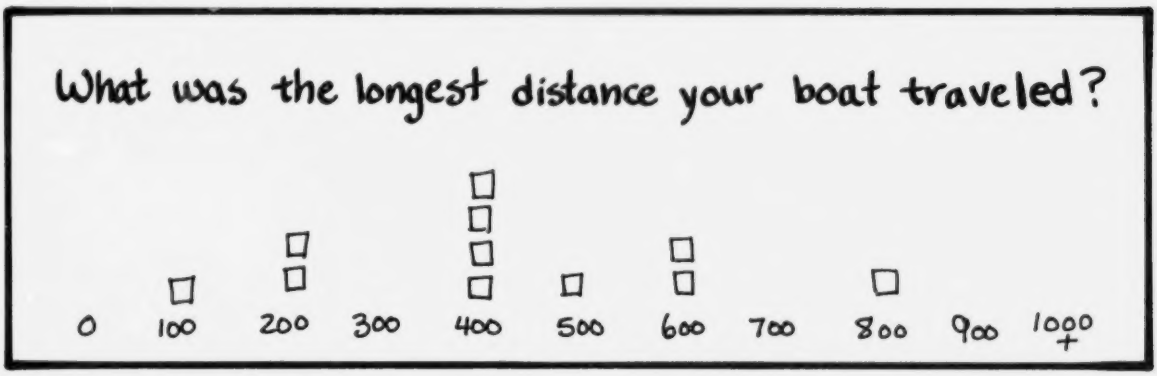
Create a child size boat out of cardboard boxes to sit in.

Music

Song "Row, Row, Row Your Boat"

Social Studies

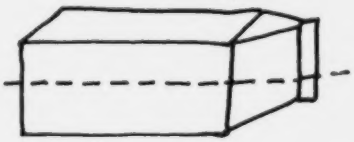
Look at boats from different countries. Are there some countries or places where you can only get there by boat? Where do they still use paddle wheel boats?



Example of class graph

SAIL AWAY... in a JET BOAT!

1.



Save top for later use.

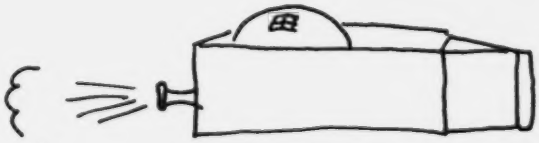
2.

Punch a hole.

3.

Pull balloon's opening through hole.

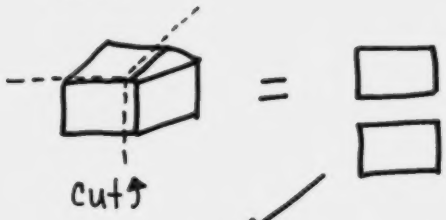
4.

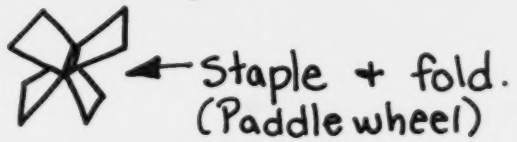


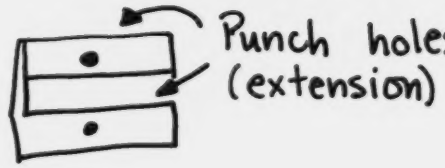
Fill balloon with air and watch it go!

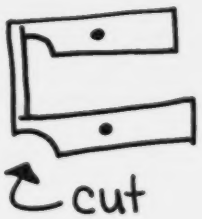
SAIL AWAY... in a PADDLE WHEEL BOAT

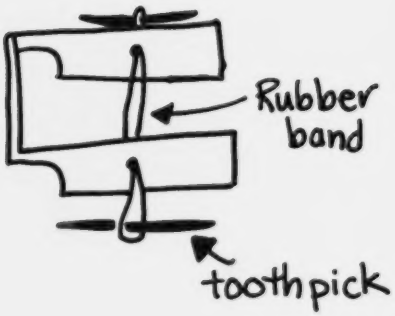
1.

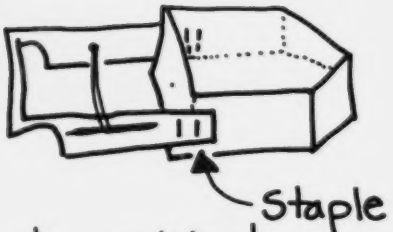
2. 

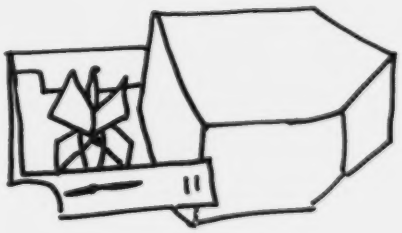
3. 

4. 

5. 

6. 

7. 

8. 

Wind up & away you go!

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SAIL AWAY...

NAME: _____

JET BOATS

How far did your jet boat travel?

5 PUFFS OF AIR _____

10 PUFFS OF AIR _____

20 PUFFS OF AIR _____

PADDLE WHEEL BOATS

How far did your paddle wheel boat travel?

5 WINDS _____

10 WINDS _____

20 WINDS _____

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Shifty Shadows

I. **Topic Area**

Movement of shadows

II. **Introductory Statement**

Students will observe how shadows rotate throughout the day.

III. **Math Skills**

a. Fractional numbers
b. Graphing
c. Measurement (time)

Science Processes

a. Gathering & Recording Data
b. Estimating & Predicting

IV. **Materials**

2 pencils or popsicle sticks per student (one marked with tape)
Dial - one per student (student worksheet)
Graph - one per student (student worksheet)
Crayons

V. **Key Question**

Do you think shadows move?
How do you think they move?

VII. **Management**

1. This activity takes 30 minutes early in the morning and approximately 5-10 minutes every hour, for 4 hours in a row.
2. Find a large dirt or grass area that is not disturbed by other students.
3. This activity works best with small groups.
4. This activity can be done as a class activity with a large class dial.

VIII. **Procedure**

1. Students cut out their fraction circle.
2. Take the students outside to a dirt or grass area. Give each child their 2 pencils or sticks. Have them place the stick with the tape in the ground.
3. They are then to look for the end of the shadow cast by the pencil and place their other pencil there.
4. Have them place their dial over the pencil with the tape (poke pencil through center circle) and line the • up with the shadow (and the other stick).
5. Ask students where they think the shadow will be in one hour. Tell them they must think carefully because they will be marking their predictions on their worksheet.
6. Return to the classroom with all the dials and have them mark their predictions on their worksheet.
7. Discuss how the dial is divided into equal parts. Show and discuss 1/2, 1/4, and 1/8. Ask them if their guess is equal to or less than 1/2, 1/4, and 1/8 (you can use any of the fractions).
8. In one hour go back out with your dials. Have the students place their dials over their marked pencil lining their • with the other pencil. Have the students look closely at where the shadow now falls.
9. Return to the classroom and have students mark on their worksheet where the shadow actually fell. Discuss how far the shadow moved. Use fractions in this discussion. Have them then predict where the shadow will be in another hour. Continue this process until you have a total of 5 readings.

X. **Discussion**

1. Discuss equivalent fractions.
2. Discuss whether the shadow travels the same part of a circle every hour.
3. Discuss how long it would take the shadow to move one half of the circle, then the total circle.

XI. **Extensions**

1. Try this experiment at different times of the year.
2. See if other object's shadows move the same parts of a circle.
3. Make a sun dial.

XII. **Curriculum Co-ordinates**

Social Studies

Study Groundhog's Day.
Study the history of telling time.

P.E.

Shadow tag.

Art

Silhouettes

Creative Writing

Story about Groundhog's Day.
Story "Me and My Shadow".

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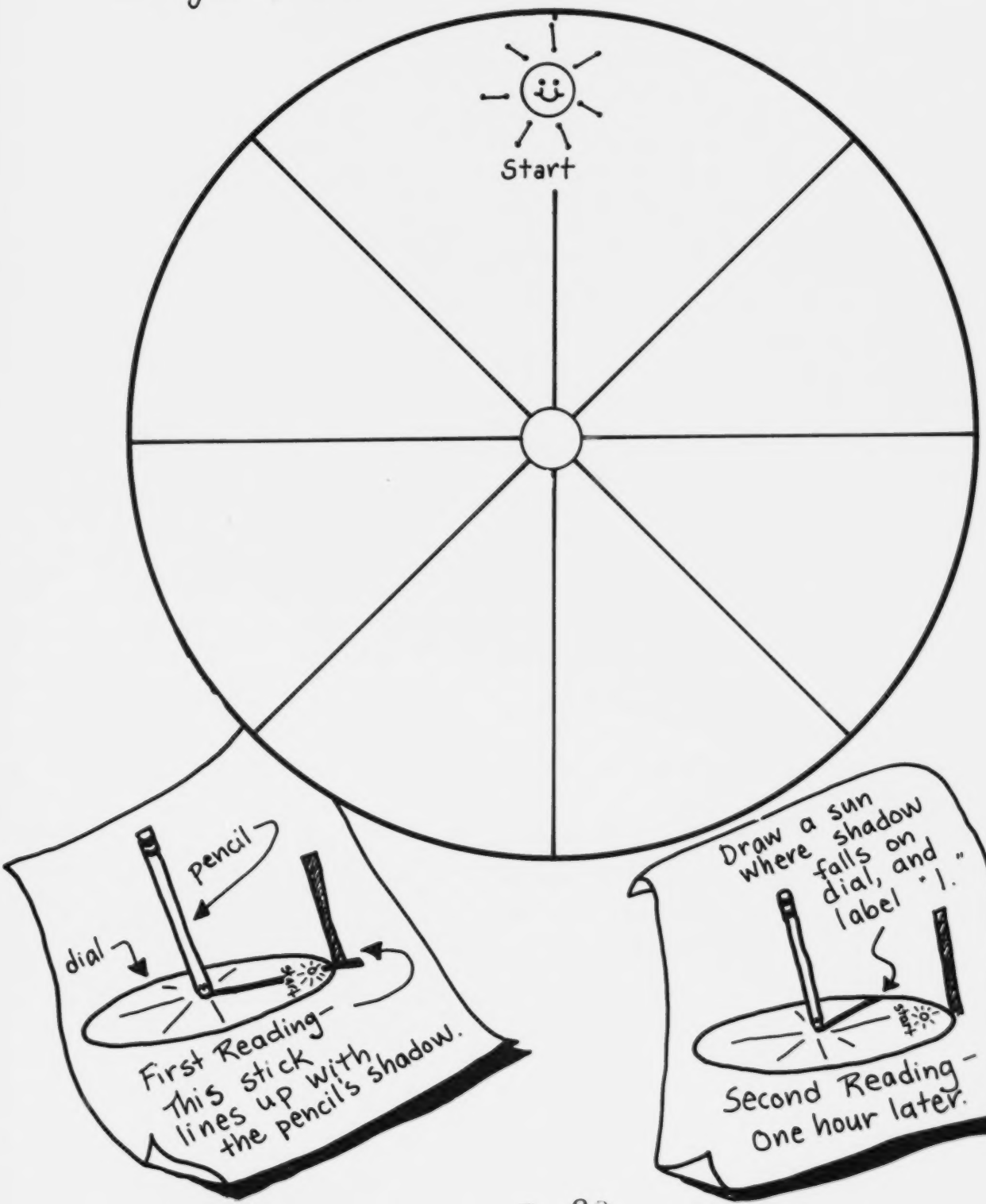
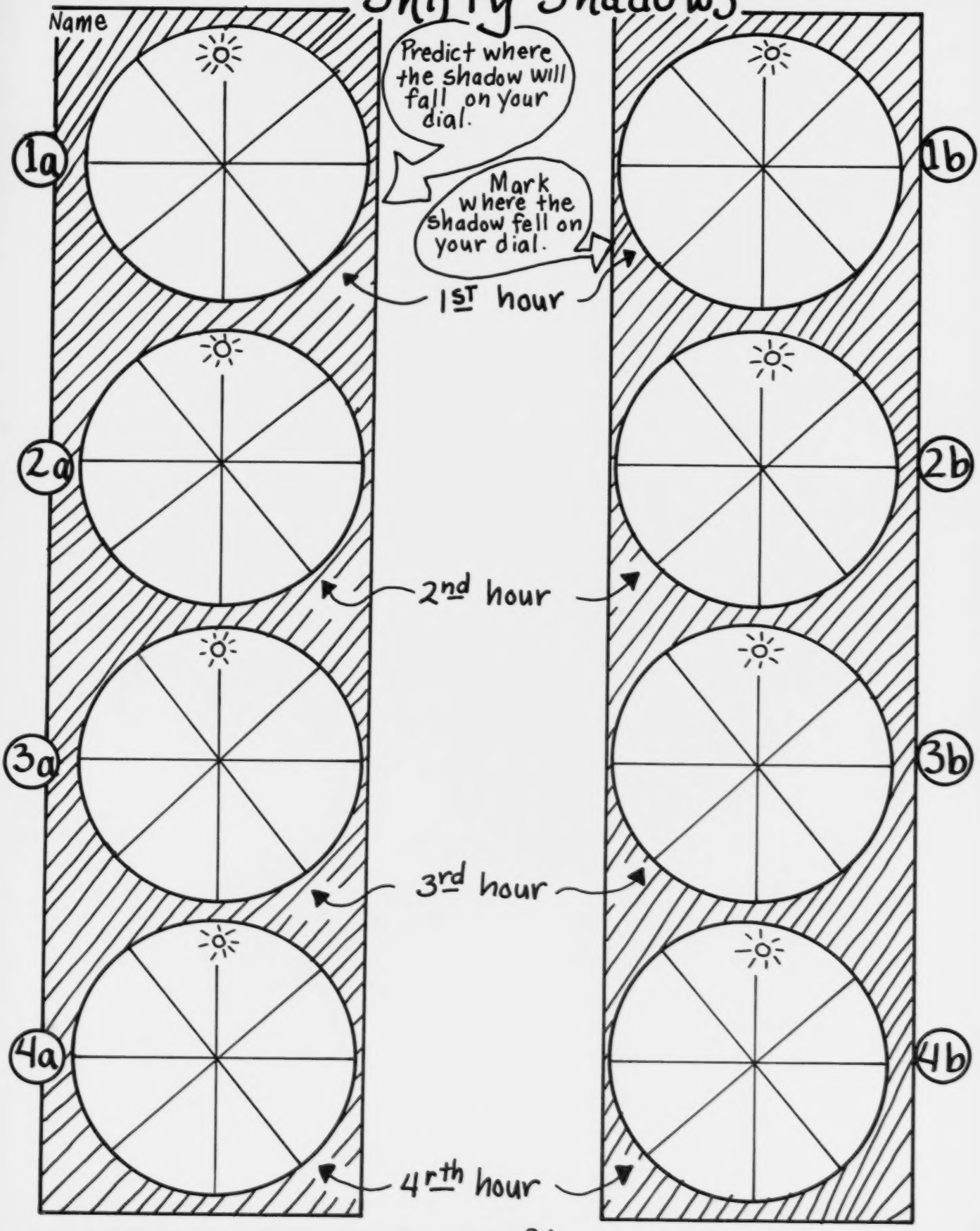
Shifty Shadows

1. Cut out the dial.
2. Put your name on the back of the dial.
3. Put a hole through the center of the dial (carefully!) with your pencil.



Shitty Shadows



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Shady Characters

I. **Topic Area**

Measurement

II. **Introductory Statement**

Students will learn how to measure the movement of shadows.

III. **Math Skills**

a. Measurement
b. Graphing
c. Estimating and Predicting

Science Processes

a. Measuring
b. Estimating
c. Gathering and Recording Data
d. Interpreting Data
e. Applying and Generalizing

IV. **Materials**

Popsicle sticks-4 for each students, or use golf tees.
Boy or girl or ground hog figure-one for each student.
A ruler or tape measure for each child.
Worksheet for each child.

V. **Key Question**

What will happen to your shadow during the day?

VII. **Management**

1. This activity should be done at least 3 times in one day; early morning, mid-morning and afternoon.
2. Pick a nice sunny day.
3. Pick a place in a grass or dirt area where other children won't bother the figures.

VIII. **Procedure**

1. The day before or the first thing in the morning the students will make a figure (boy, girl or ground hog) glued back to back with a stick.
2. First thing in the morning have the students put their figure in the grass or dirt. Put a popsicle stick at the end of their shadows.
3. Mid-Morning: Back in class the children will estimate how much they think their shadow will move and record the time.
4. Outside the children will place a popsicle stick at the end of their shadow.
5. Using a ruler or tape measure each child will measure the movement of their shadow and record their answers.
6. Afternoon: Back in class the children will estimate how much they think their shadow will move again.
7. Repeat above procedure. Measure from the present shadow to the one just previously measured.
8. Record their answers.

X. **Discussion**

1. Did your shadow change?
2. How did it change in length?
3. When is your shadow the longest?
4. When is your shadow the shortest?
5. What time of day was your shadow the longest, shortest?

XI. **Extension**

1. Measuring the shadows of other objects, trees, building etc.
2. Figuring out how much each shadow will move in a certain time.

XII. **Curriculum Coordinates**

Language Arts

Creative Writing-when the groundhog came out what did he do and why?

Art

Making shadows using black construction paper.

P.E.

Shadow Tag-chasing each others shadows.
Shadow Shape-tracing shadows and trying to fit into another persons shadow shape.

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SHADY CHARAC-TERS

GIRL

Seasoning Math and Science, Book B

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SHADY CHARAC-TERS

BOY

Second Fold

Second Fold

First Fold

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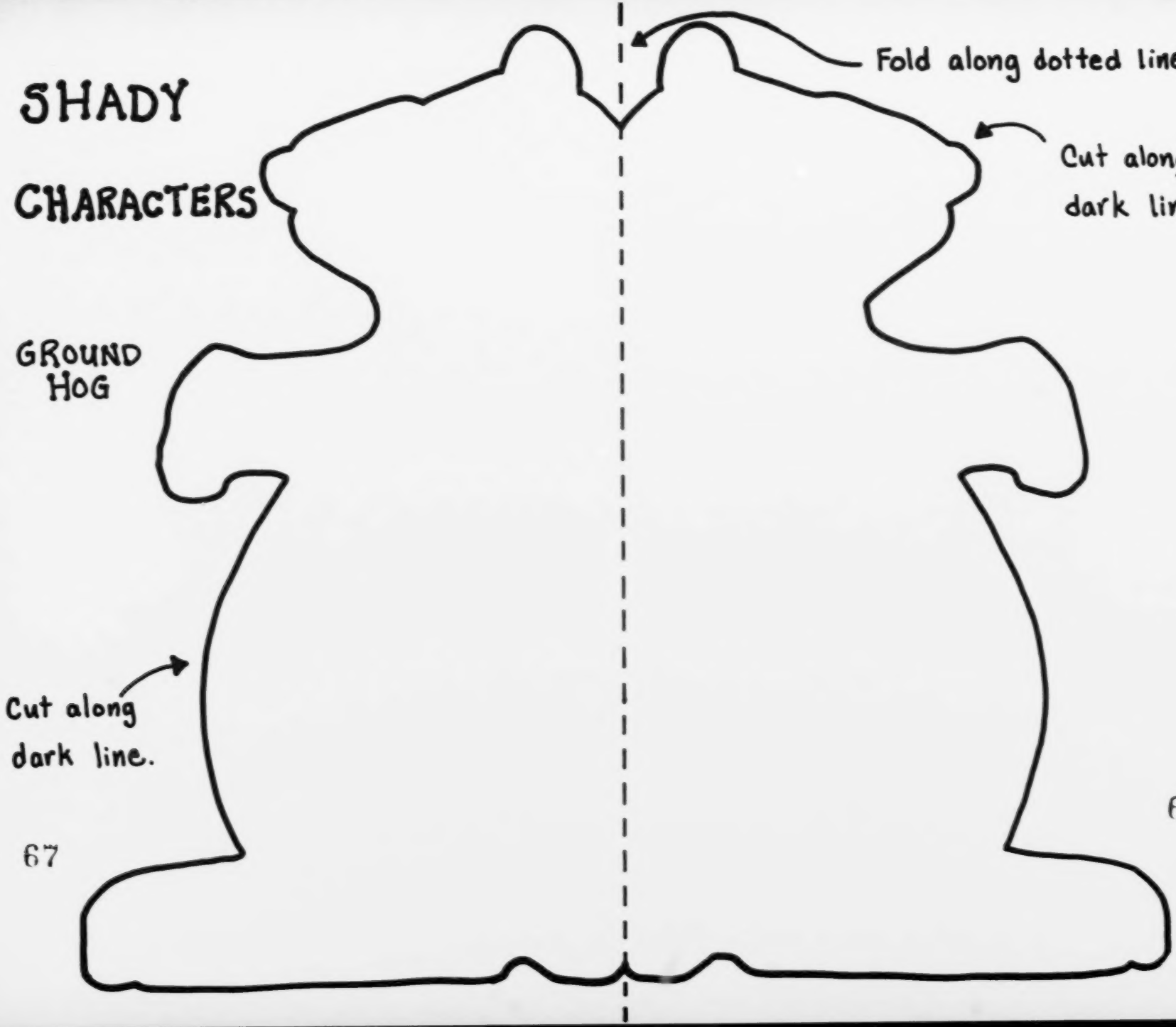
SHADY CHARACTERS

GROUND HOG



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Shady Characters

Name _____

Time		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
____	Estimation of distance between 1ST + 2ND shadow marks																								
	Actual Distance																								

Time		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
____	Estimation of distance between 2ND + 3RD shadow marks																								
	Actual Distance																								

Time		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
____	Estimation of distance between 3RD + 4RTH shadow marks																								
	Actual Distance																								

Seasoning Math and Science, Book B

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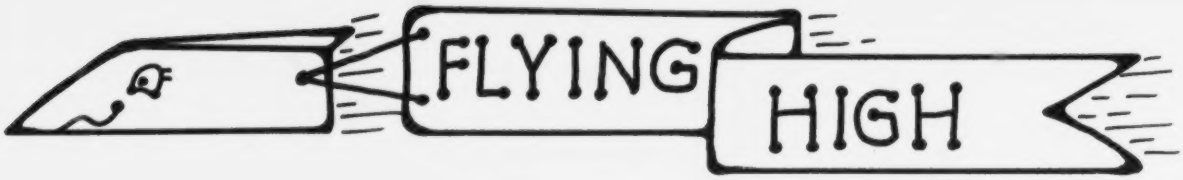


I. **Topic Area**

Aerodynamics - making and flying paper airplanes.

II. **Introductory Statement**

The children will experiment with making paper airplanes to see which plane will fly the longest distance.

III. **Math Skills**

a. Measurement
b. Graphing
c. Fractions
d. Geometry

Science Processes

a. Observing
b. Recording data
c. Measurement
d. Applying & Generalizing

IV. **Materials**

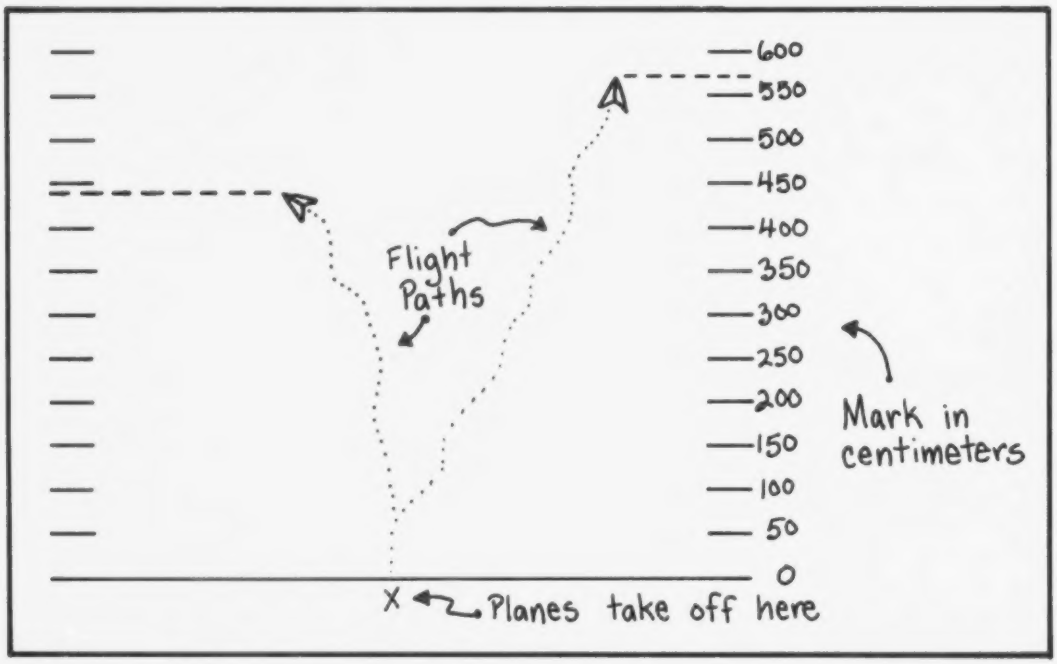
8½ X 11" typing or duplicating paper - at least two sheets per student
Meter or yardsticks
Masking tape
Paper clips (if children request them)
Student pages
Pencil
Crayon

V. **Key Questions**

Which design of paper airplane will fly the longest distance? How can we find out?

VII. **Management**

1. This lesson will take up to two hours.
2. You may teach this as one long lesson or as two or three shorter lessons.
3. This can be a small group activity or with the whole class.
4. A large area, either indoors or in the yard, will be needed for flying the planes.
5. If there is any wind you should plan on flying indoors.
6. You can mark the flying area ahead of time or you can have the children help with the measuring and marking.
7. Lay-out the flying area as follows:



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VIII. Procedure

1. Step One
   a. Give each child a piece of paper and tell him to make a paper airplane. Allow five to ten minutes for this activity.
   b. Observe the types of planes and discuss the key questions.
   c. Take the planes to the flying area and allow each child to fly his plane.
   d. Children should compare the distances flown.
   e. Allow 10 minutes for discussion of the types of planes, their shapes, how they were made, etc.
2. Step Two (optional)
   a. Allow children five to ten minutes to improve their planes, or let them make one at home with help.
   b. Repeat "c", "d", and "e" from Step One.
3. Step Three
   a. Divide the class into groups of 5 or 6 students each.
   b. Each child is to make an airplane, either by himself or with the help of someone in his group.
   c. Children then record the names of their group members on a student page one.
   d. The class will take their planes to the flying area, which is marked in fifty centimeter lengths.
   e. One group at a time will fly their planes and measure and record the distances for each member. (Repeat until all groups have flown their planes.)
   f. Each group will record their longest distance on the chalkboard or on a chart provided by the teacher.
   g. The students then graph the longest distance for each group on student page two.

X. Discussion

Which group's distance was the longest?
Which group's distance was the shortest?
What shapes did we see in the plane?
How was the winning plane made?
What was the wingspan of the winning plane?
What was the length of the winning plane?

XI. Extensions

1. Develop a worksheet in addition and subtraction using the distances flown, i.e.
   a. Longest distance minus each of the other distances.
   b. Add distance A to distance B, etc.
   c. Total all the distances.
2. Make planes using larger or smaller pieces of paper.
3. Make planes using different weights of paper.
4. Use one pattern for all children to make the same plane to compare distances depending on who threw it.

XII. Curriculum Co-ordinates

Art

Draw pictures of planes in flight
Color a design on their paper plane
Origami - folding paper

Social Studies

A study of different types of planes
Study the history of flight
Study famous pilots
Visit an airport

Language Arts

Write a story about flying
Read stories about planes/flying

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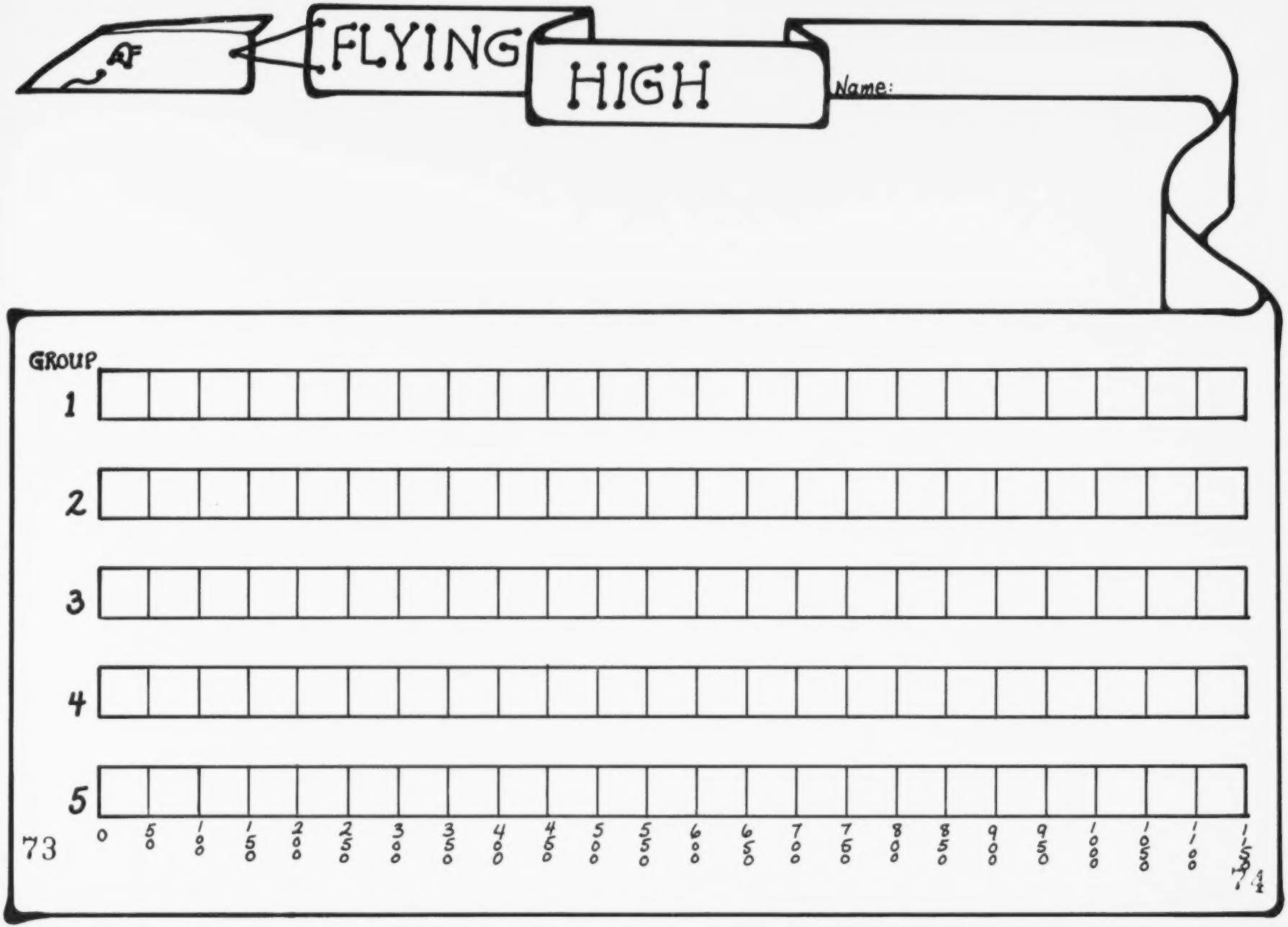

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List the names of the pilots in your group. Fly your planes and measure the distances flown. Record the distances.

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Circle the highest number for your group.

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3.. 2.. 1.. BLAST-OFF BALLOONS

I. Topic Area

Rocket Balloons

II. Introductory Statement

Students will learn how a rocket works and will chart how far a balloon will travel along a string.

III. Math Skills

a. Counting
b. Linear Measurement
c. Geometry - recognizing shapes
d. Graphing
e. Estimating and Predicting

Science Processes

a. Observing
b. Controlling Variables
c. Gathering and Recording Data
d. Interpreting Data
e. Applying and Generalizing

IV. Materials

10 Meters of strong string
Chart (see student pages)
1 package of inexpensive balloons, number dependent on the number of trials desired
1 or 2 sturdy plastic straws
Masking tape
Large felt marking pen
Pencils
Meter stick

V. Key Questions

How far will your rocket travel along a string?
If the air comes out one end of the balloon, in which direction will the balloon travel?

VI. Background Information

See student pages

VII. Management

1. Before class begins, measure 10 meters of string at one meter intervals in a highly visible color such as black. Use a red mark for 5 meters. Mark half meters with a different color and mark "0" with green.
2. Prepare chart with the heading, "How far will your rocket travel along a string?" and sub-headings "Rocket's Name", "Prediction", and "Distance Traveled". See student pages for diagram.
3. Place straw on string - longer balloons may need 2 straws.
4. You may fasten string so that it runs from wall to wall at a four foot high level, or students may hold the two ends. In either case, the string must be taut.
5. This investigation works extremely well as a class activity and may take 45 to 60 minutes, depending upon length of discussion.

VIII. Procedure

1. Discuss the space shuttle, John Glenn and his space capsule, satellites, video games with a space theme, etc.
2. Display and discuss diagram of how a rocket works (see student pages).
3. Direct attention to the class chart, also known as the "Mission Control".
4. Put students into 4 or 5 groups. Give each "Captain" a balloon with directions not to blow it up until Mission Control's signal.
5. Show how the balloon rocket attaches to the straw and moves along the string. Bring up Newton's law that states that for every action, there's an equal and opposite reaction. If a balloon is blown up and then released, it will fly in a random pattern, which is hard to measure. Taped to the straw it will go in a straight line. Ask the students which way the air should be released for the balloon to travel along the string.
6. Note to the students how long a meter is. Point out the marks along the string.
7. Ask the first "team of astronauts" to name their rocket and to predict how far it will go, in meters. They must all agree. Record the name and prediction of the class chart. Do this with each team.
8. Pass out the student worksheets to each student. Have students record the color, shape and name of their rocket and record their team's prediction.
9. After the students have completed this part of the worksheet, call on the first Capt. to approach the launch pad.
10. Have one of the students fill the rocket with "fuel", in other words, fill it with air. This student is the fueling station. Count and record the number of breaths for fuel on student sheets, for that team.
11. Twist and have the captain hold the balloon. Call up the rest of the team. The captain will assign two teammates to hold the ends of the string, or the string may be secured between two walls or two chairs.
12. Say, "Quiet in the Control Tower; ready for launch!" Practice with the class counting backwards from 10: ". . . 3. . 2. . 1. . 0. . ignition. . blast-off!!"
13. When students are ready, recall the prediction, then count down and have student release the balloon from the green starting mark.
14. Count the marks on the string to determine the distance travelled by the rocket. Record on chart and worksheets. If time permits, fuel the balloon as it's attached to the straw and launch a second time. Record in the same column. You may choose to tape the balloon to the chart after it has been used.

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15. Repeat directions 13 and 14 with the other teams of astronauts.
16. To add interest, use space terminology; and the class will feel intensely involved if they are called the "Control Tower" and all join in on the countdown.
17. When all the rockets have been launched, compare the predictions to the distances traveled by each rocket.

X. **Discussion**

1. Which rockets came closest to its prediction?
2. Which rocket traveled the furthest? the shortest distance?
3. Did the amount of fuel or shape and size of the balloon have anything to do with the distance traveled? How?
4. How could you do this at home: How could you change the project?

XI. **Extensions**

1. Study the solar system and the movement of the planets and the moon.
2. Learn some of the most recognizable constellations and their mythology.
3. Find out the many uses for rockets.

XII. **Curriculum Coordinates**

Language Arts

1. Literature, newspapers and magazines with news regarding NASA, the space shuttle and space exploration. Keep a "Space Bulletins" board.
2. Explore science fiction and compare to news clippings and space exploration history.
3. Read and write stories about rockets.

Music

1. *Science in a Nutshell* from Kimbo, a record set and book, has related activities and a song, "Fly to a Distant Star."
2. "Twinkle, Twinkle, Little Star."
3. "Hey, Diddle Diddle."
4. "Rocket Man," by Elton John.

Social Studies

1. Look at different countries who have sent people into space.
2. Study about American women and minorities in the space industry.
3. Study the development of airplanes, jets and rockets.

Art

1. Draw rockets, the solar system, space themes, alien beings.
2. Make a large rocket from cardboard boxes and decorate it. Use it as a special activity or "free time" reward.

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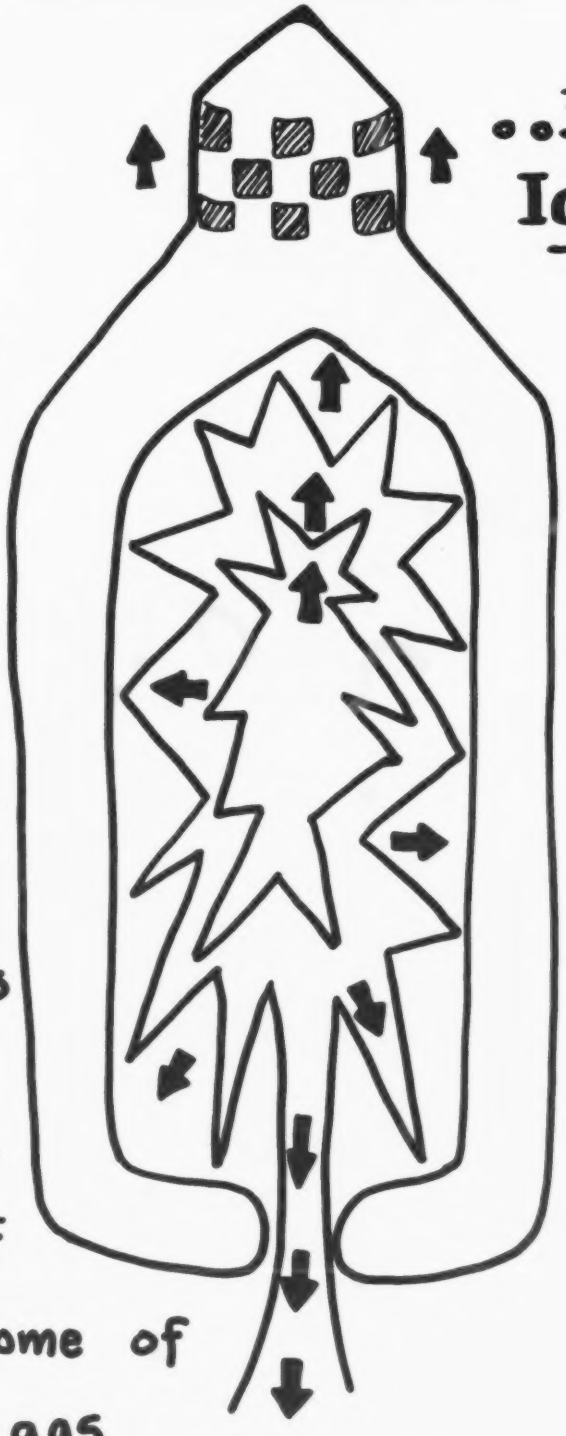
Inside a Rocket



..3..2..1..
Ignition

Blast Off!

A rocket's power comes from fuel which squirts into the burner and ignites. It burns very hot and pushes against the inside of the rocket. Some of the burning gas escapes through a hole in a fiery blast. The gas pushes on the top side of the rocket. As the blast comes out the bottom, the rocket goes up!

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MISSION CONTROL

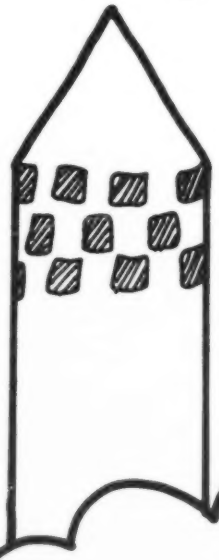
How far will your rocket travel along a string?

Rocket's Name	Prediction	Distance Traveled

3.. 2.. 1..

Name _____

BLAST-OFF BALLOONS



_____
Rocket's Name

_____
Rocket's Color

_____
Rocket's Shape

_____
Fuel (Number of Breaths)

_____
Distance Traveled (in meters)

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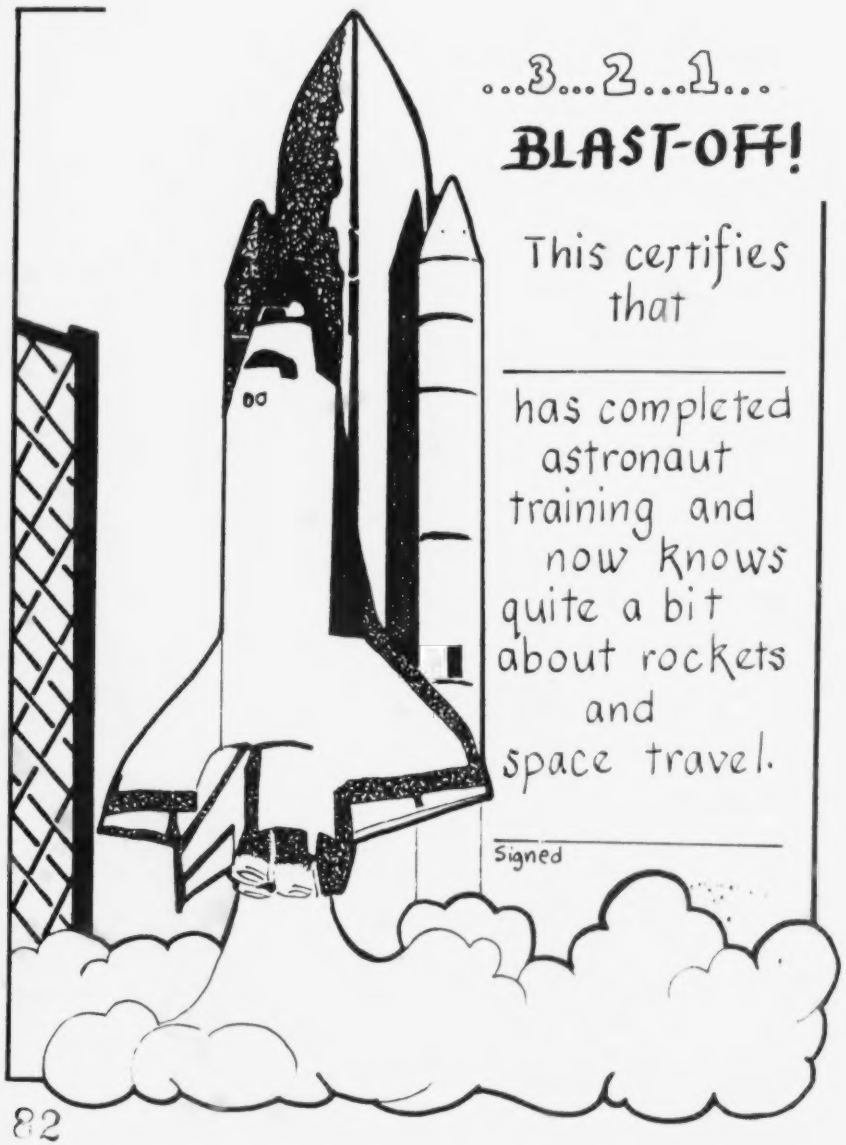


...3...2...1...

BLAST-OFF!

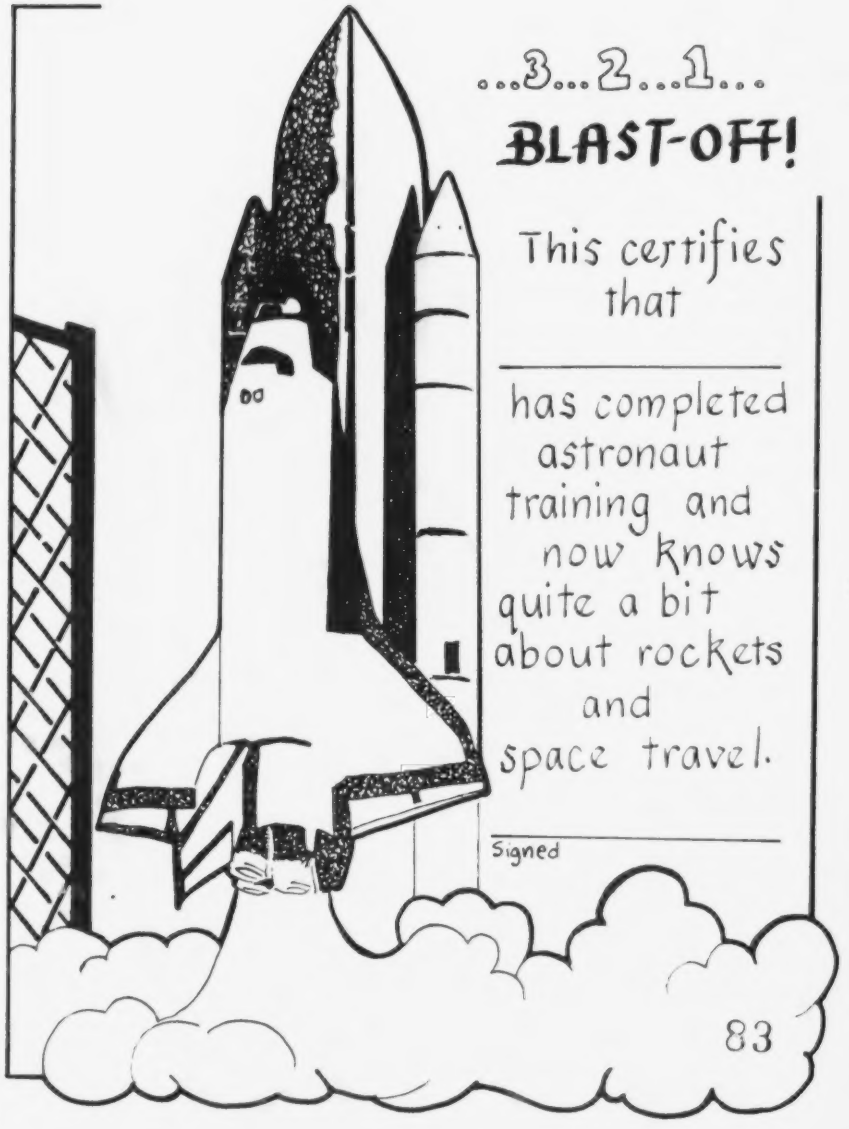
This certifies that

_____

has completed astronaut training and now knows quite a bit about rockets and space travel.

Signed _____

82



...3...2...1...

BLAST-OFF!

This certifies that

_____

has completed astronaut training and now knows quite a bit about rockets and space travel.

Signed _____

83

Seasoning Math and Science, Book B
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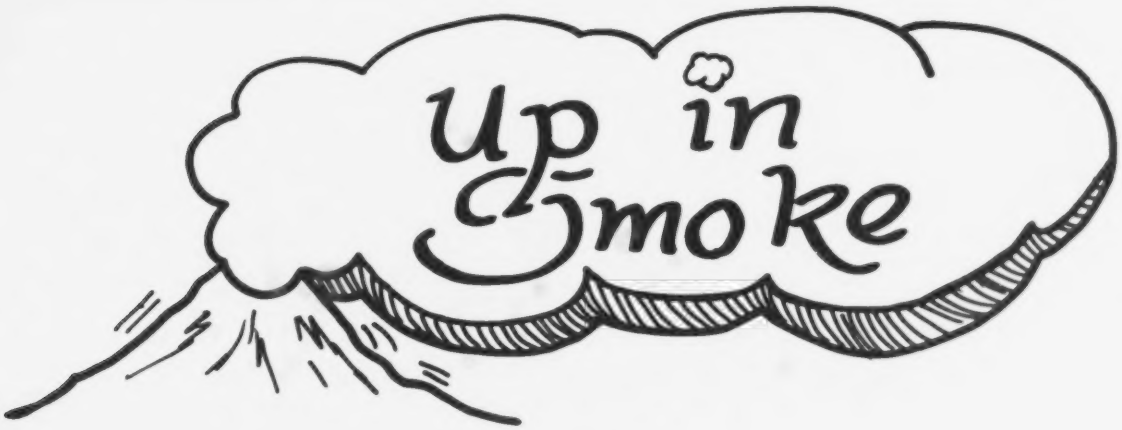

I. **Topic Area**

Volcanoes - Chemical Reaction.

II. **Introductory Statement**

Students will make their own volcanoes out of plaster and will demonstrate a mock eruption. The students will measure the distance the "lava" travels from the base of the volcanoe.

III. **Math Skills**

a. Measurement
b. Graphing

Science Porcesses

a. Controlling Variables
b. Gathering and recording data
c. Measurement
d. Observing

IV. **Materials**

Plaster mix approximately 8 lbs. for a class of 30.
Mixing bowl
Spoon or stick
Modeling clay
Cone-shaped paper or plastic cups 1/student
Newspaper
Baking soda
Vinegar
Food coloring - yellow, orange, red, purple
Plastic wrap
Centimeter ruler
Crayons
Measuring spoons
Student worksheets
Optional - Brown powdered Tempera paint

V. **Key Question**

How far will the "lava" flow?

VI. **Background Information**

Red-hot melted rock under the earth's surface is called magma. When magma reaches the earth's surface, it is called lava.

Magma rises toward the earth's surface because it is lighter than solid rock. It forces its way out through a weak spot or crack in the earth's crust.

Steam, rock bombs, gases, and ash combine with the lava to pile up, cool, harden, and form a mountain. A mountain formed this way is called a volcano.

VII. **Management**

1. This activity takes 2 periods on different days. 1st at a center 10-20 minutes. 2nd at a center 10-30 minutes.
2. At the first center, you will be mixing and pouring the plaster. Be sure that everything is set up before the students arrive.
3. At the second center, make sure table is covered with newspaper.
4. You could have the rest of the class working on the following activity while working with the small groups.
   a. Write 2 sentences about a volcano (you could put vocabulary words on the board).
   b. Draw a picture of a volcano.
5. Go over graphing with your students prior to this activity if necessary.

VIII. **Procedure**

Day one

1. Have a plaster, bowl, water, spoon, cups and clay set up on a table.
2. Have students come in small groups.
3. Give each student their own cup and a ball of clay the size of a large marble.
4. Students write their name on their cup and push their ball of clay into the bottom of their cup. Make sure the heighth of the clay does not exceed one inch.
5. Have students work together measuring and mixing the plaster according to directions on the package (do not mix too much or plaster will set up too quickly). If there aren't any directions on the box mix to the consistency of pancake batter. Powdered Tempera paint can be added for color.
6. Students pour the plaster into their cups and set aside to harden.

Day Two

1. Have the center table covered with newspaper and ready with measuring spoons, baking soda, vinegar, plastic wrap, centimeter ruler and student worksheet. Have vinegar in 4 containers of different colors: yellow, red, orange and purple.
2. Have students come to the center with their cups and crayons.
3. Peel the cups away from the volcanoes and remove the clay. Write the students name on the bottom of their volcano.

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4. Give each student a piece of plastic wrap, (large enough to cover their volcano).
5. Have them cover their volcano (they can secure at base with a rubber band if necessary). Then put one tablespoon of baking soda in their crater (over the plastic wrap).
6. Give each student their volcano worksheet. Explain how this is a "birds eye" view of their volcano with the larger circle being the base of the volcano and the smaller being the crater.
7. Have the student start the process by adding ½ teaspoon of the yellow vinegar to their volcano and observe what happens.
8. Have him/her then color in the area that reacted, on their worksheet with a yellow crayon.
9. If the "lava river" flows beyond the base of the volcano, have them measure the distance it flowed and draw the same distance on their worksheet.
10. Let the other students go through the same process.
11. Have the students continue the process using more vinegar and different colors of crayons. The steps are:
    a. ¼ teaspoon-yellow
    b. ½ teaspoon-orange
    c. 1 teaspoon-red
    d. 1½ teaspoon-purple

X. **Discussion**

1. What makes the baking soda react more?
2. What other fluids could make this reaction?

XI. **Extensions**

1. Try this experiment with a larger volcano.
2. Try this experiment with a deeper crater.
3. This experiment would go well with "Sorta Pop" in the AIMS, K-1 winter book.

XII. **Curriculum Co-ordinates**

Social Studies

Study some of the recent volcano action such as Mt. St. Helens.
Study the "Ring of Fire".

Art

Paint your volcano.
Draw a picture of a volcano.

Language

Do a creative writing story about volcanoes.
Do a report on volcanoes.

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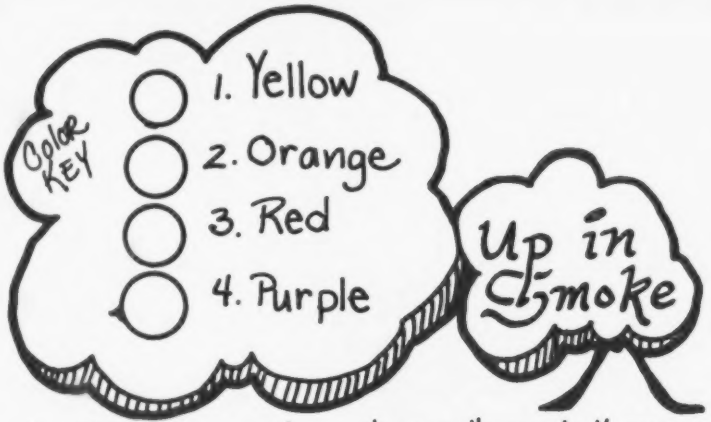

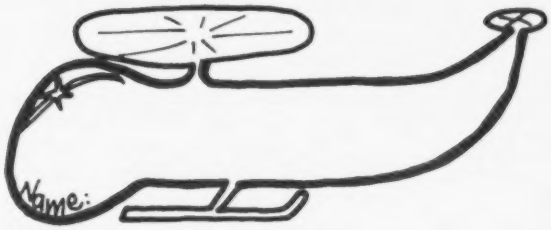

1. You are in a helicopter.
2. You are looking down into the crater of an active volcano.
3. Each time the volcano "erupts," measure how far the "lava flow" goes from the base of the volcano.
4. Draw each eruption using the color key.

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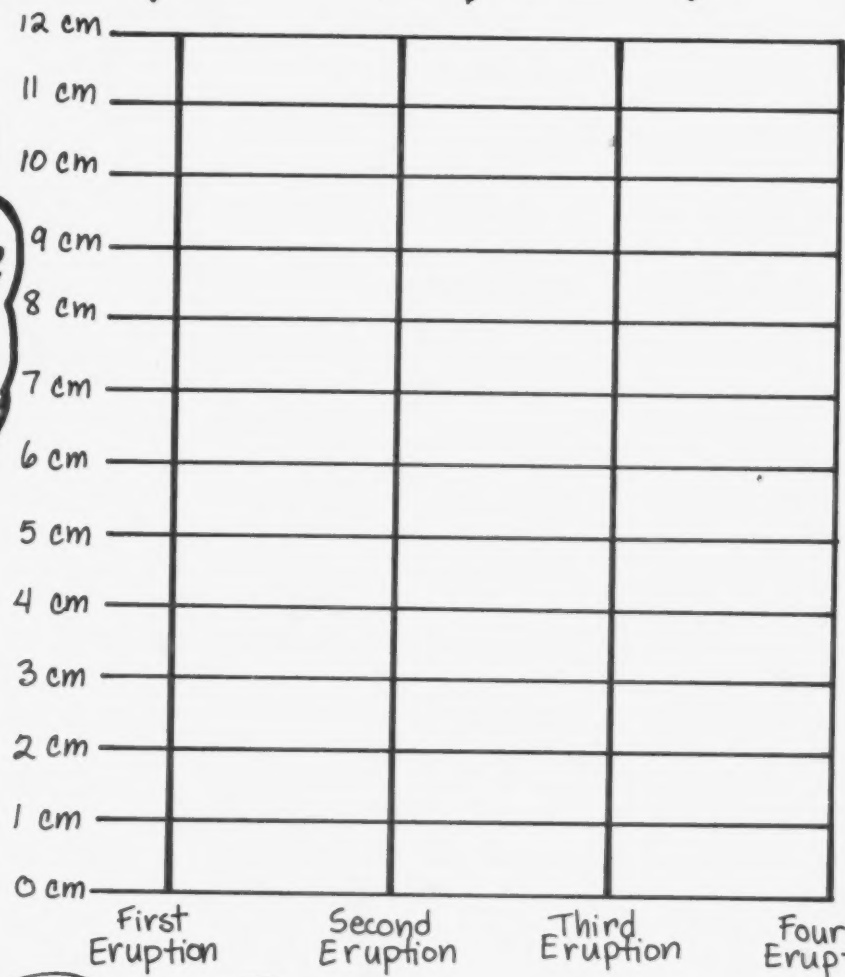
Up in Smoke Graph



1. Plot how far the "lava" flowed in the first eruption by making a dot on the line.

2. Plot for all of the eruptions.

3. Connect the dots.

The cone-shaped volcanoes erupt with ash, cinders, and rock bombs. Mount Saint Helens is an example of this type of volcano with steep sides. It erupts with powerful explosions and changes the shape of its cone and the land around it.

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Up in Smoke Word Find

t	c	o	n	e	s	
k	n	v	p	m	s	m
v	o	l	c	a	n	o
s	c	t	b	g	s	k
h	i	f	d	m	m	e
i	n	k	l	a	v	a
e	d	c	p	m	p	s
l	e	r	u	p	t	h
d	r	s	m	r	s	n

Find these hidden volcano words. The words go down or across.

ash
erupt
lava
cinder
smoke
volcano
magma
cones
shield

The shield type of volcano is made from layers of lava and ash. It has gentle slopes. The lava flows from cracks in the sides or at the base of the volcano. The Hawaiian Islands were made by this kind of volcano.

Lite WEIGHTS

I. **Topic Area**

The rate of falling objects.

II. **Introductory Statement**

Students will observe if objects of different mass fall at the same rate.

III. **Math Skills**

a. Graphing
b. Estimating
c. Weighing
d. Ordinal Numbers
e. Sequencing

Science Processes

a. Recording data
b. Observing
c. Comparison
d. Estimating

IV. **Materials**

Paste
Scissors
Balance-Scale
Crayons-2 colors
Sponge
Plastic lid
Student pages
Standard Units of weight
Straw
Marble
Feather

V. **Key Questions**

When you drop different objects will they hit the floor at the same time?
Does the weight of an object effect how fast it will fall?
Does a heavier object fall faster than a lighter object?

VI. **Background Information**

1. All objects fall at the same rate in a vacuum (an airless environment). A feather will fall as fast as a lead ball. However, we live in a world surrounded by air. Air gets in the way of falling objects and slows them down. This is called air resistance. Objects with a large size in comparison to their weight fall at a slower rate than objects of the same weight but of a smaller size. This is because more air gets in the way of large object and slows it down. In a vacuum all the objects in this activity would fall at the same rate. Because of air resistance the larger objects (feather, straw, lid) will fall slower than the small dense objects (marble).

VII. **Management**

1. This activity will take two sessions of 45 minutes each.
2. Do the cutting and pasting page separate from the graph page.
3. This activity may be used with the whole class or small groups.

VIII. **Procedure**

1. Students will estimate how much the feather weighs, record and graph on student page.
2. Students will weigh the feather, record and graph on student page.
3. Repeat steps 1 and 2 with the straw, plastic lid, marble and sponge.
4. Students will cut off the bottom of the Mass Graph page and cut out each one in the row 1 of pictures of objects, and arrange and paste them on Mass Graph row from heaviest to lightest using information on the Weight Graph.
5. Students will estimate which objects fall the quickest to slowest, and cut out pictures of objects in row 2 and arrange and paste them on Estimate Fall Graph row from quickest to slowest.
6. Students will then do the "comparison drop", two objects will be droped at the same time from the same height. Students continue to drop pairs of objects until they arrange the objects in proper sequence.
7. Students will then cut out pictures in row 3 and paste them in place on Actual Fall Graph row from quickest to slowest.

X. **Discussion**

1. Did the feather weigh the same or more than the straw?
2. Did the feather fall faster or slower than the straw?
3. Comparing graphs, were any the same?

XI. **Extension**

1. Compare rate of fall, and weight with other light weight objects. Make a list of those that fell at the same rate of speed with those that did not.
2. Make a parachute, using a handkerchief, string and rock, or other objects in place of the rock.

XII. **Curriculum Coordinates**

Language Arts

Write a story about how they would feel if they weighed very little, could float or fall without getting hurt.

Art

Draw a picture of their new body to go with story.

P.E.

Throw objects up on a regular size parachute while your class is throwing it up in the air and see what happens to the objects.

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lite WEIGHTS

Name:

1.

HEAVIEST — MASS — LIGHTEST

2.

QUICKEST — ESTIMATE FALL — SLOWEST

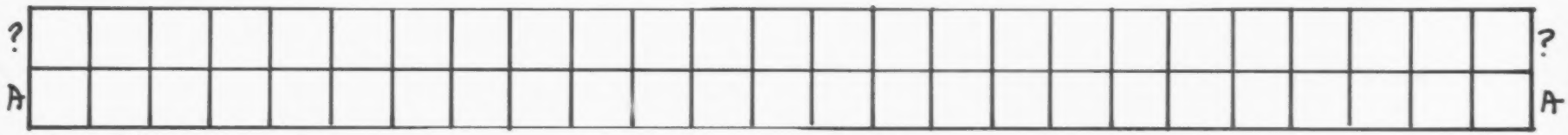
3.

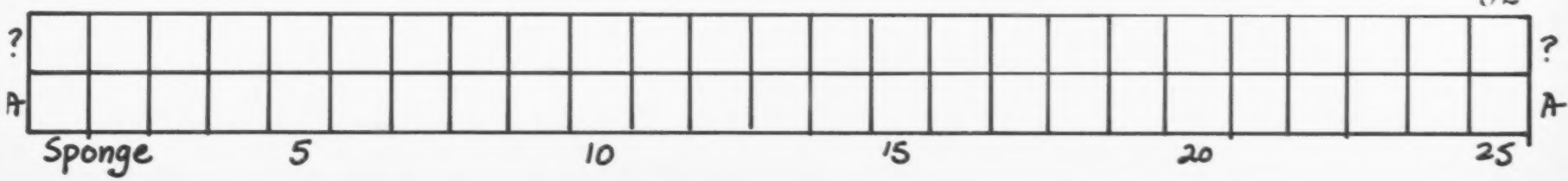
QUICKEST — ACTUAL FALL — SLOWEST

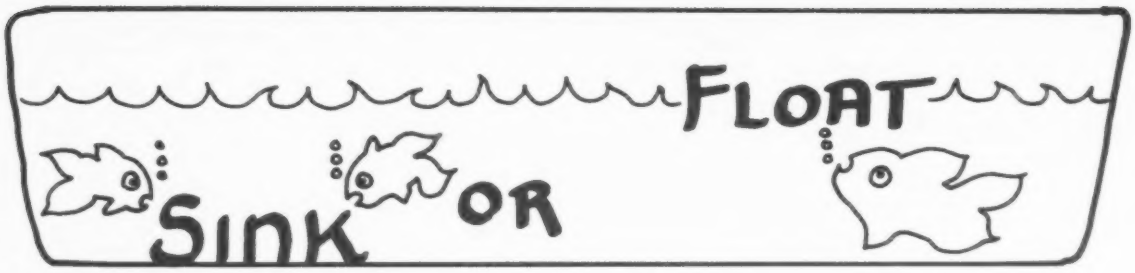
- - - -

Lite WEIGHTS

Name:







I. **Topic Area**

Buoyancy

II. **Introductory Statement**

Students will weigh objects then predict whether each object will float or sink.

III. **Math Skills**

a. Graphing
c. Sequencing
d. Predicting

Science Processes

a. Observing

IV. **Materials**

Bucket or tub
Pencil
Marble
Clay
Eraser
Paper clip
Wood block
Student worksheet
Scissors
Paste
Scale
Weights

V. **Key Question**

Which objects weigh the most? What objects do you think will float?

VII. **Management**

1. This activity lends itself well to a station. Have pencil, marble, clay, eraser, paper clip and wooden block placed out on a table for children to handle and observe. The bucket should be filled with water. Weights and scale should be set up.
2. If you wish to do this as a total class have one set of objects, one bucket, one scale and weights for every 5 to 6 students. This activity takes approximately two 20 minute periods or one 40 minute period.

VIII. **Procedure**

1. Have the students handle and weigh the objects. Record weight on pictures.
2. Have them place in order according to weight. They are then to cut out the pictures of their objects and paste in appropriate order.
3. Have them think about which will float and which will sink. They are then to cut out the next row of pictures on worksheet A and paste them in the appropriate space.
4. This is a good stopping point if you wish to do this activity in 2 days.
5. After they have made their predictions have them cut out the pictures of the objects on worksheet B. They can then test each object and record what actually happens.

X. **Discussion**

1. What made the objects float and not sink?
2. What can you do to the sinking objects to make them float?
3. Do the heaviest objects always sink?
4. What other objects can you think of that float?

XI. **Extensions**

1. Have students bring in objects from home to see if they sink or float.
2. Have students build boats out of different materials and test for buoyancy.

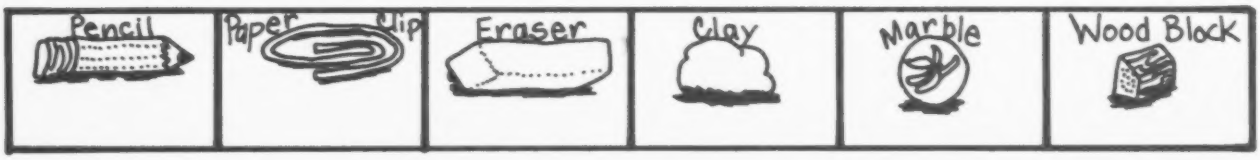
XII. **Curriculum Coordinates**

Art

Have students do a crayon-water color resist picture, showing objects above and below the water.

Creative Writing

Write an underwater adventure story.



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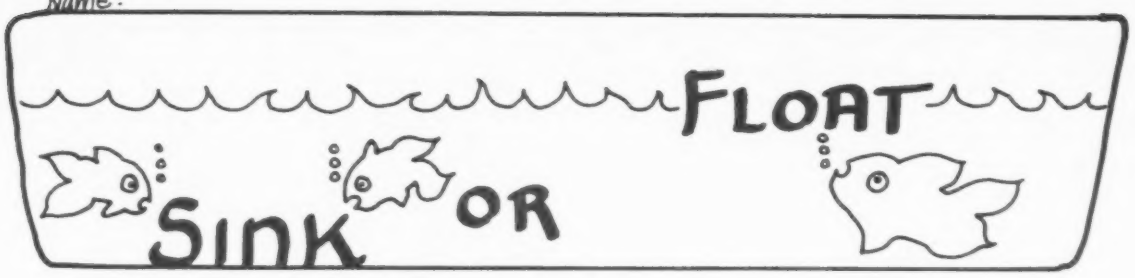
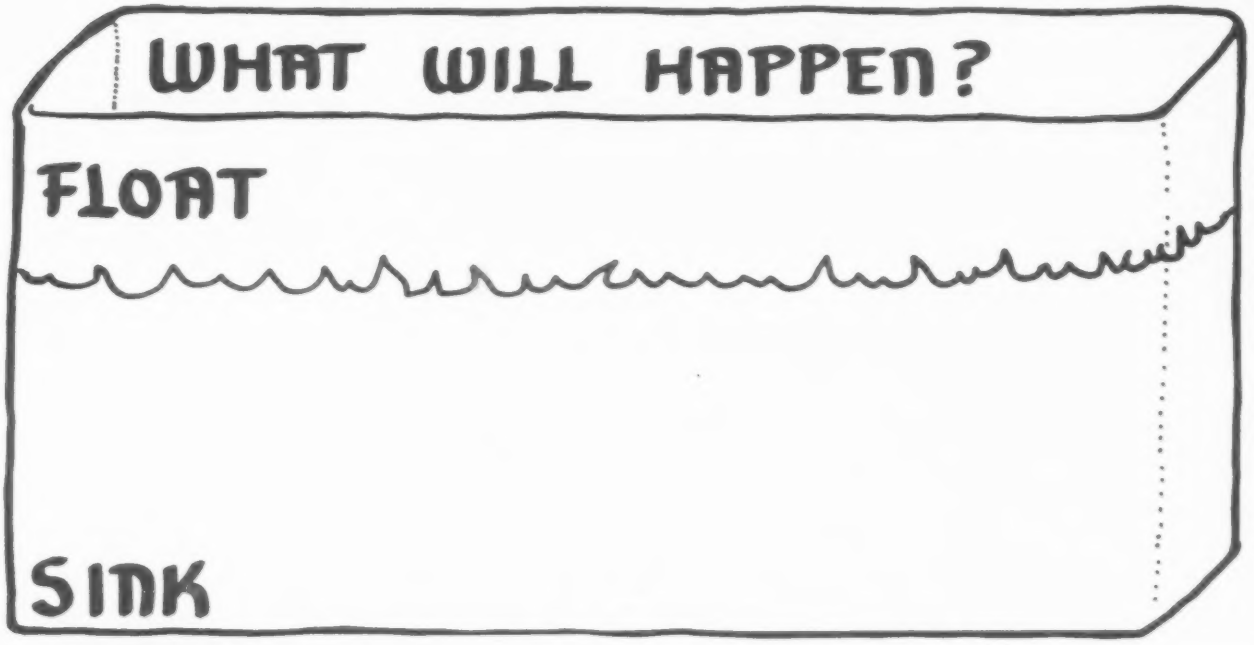
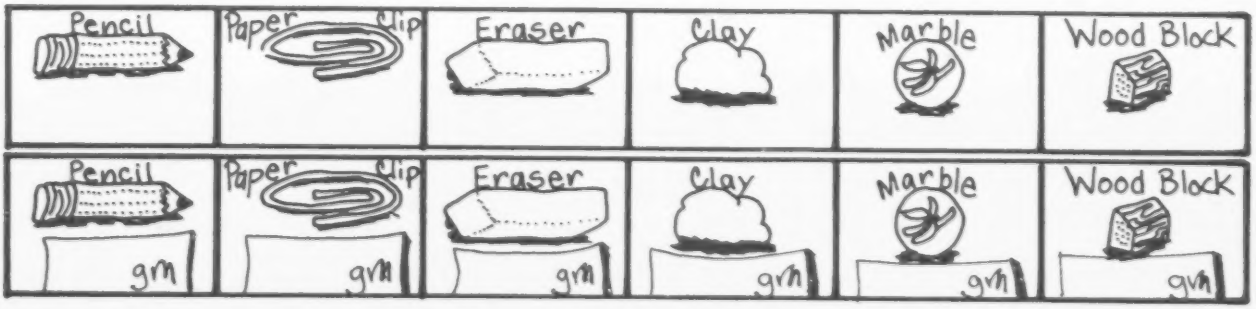


Sequence the weight of your objects:

Lightest Heaviest





1. Record the weight of each object in the box.
2. Cut out the pictures in that row.
3. Place & paste them in the correct order at the top of the page.
4. Cut out & paste the other row of pictures in the tank. Will they sink or float?

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Name:

SINK OR FLOAT

WHAT DID HAPPEN?

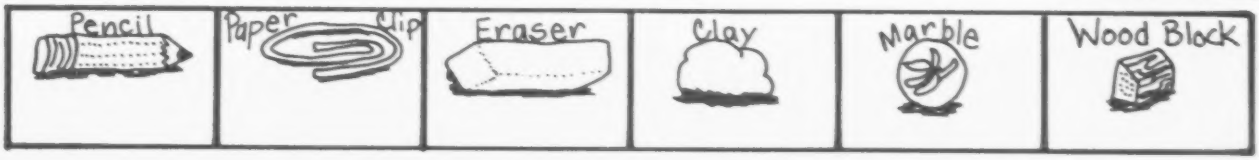
FLOAT

SINK

Number correct:
5 - Hot shot
5 Good aim
4 Still afloat
3 Life Jacket
2 Need a lifeguard!
1 You're sinking

1. How many objects did what you predicted? ____

2. How many did not do what you predicted? ____



1. Test each object to see if it will sink or float.
2. Cut out the pictures.
3. Place and paste them in the correct place in the tank.

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A Sure Weigh

I. **Topic Area**

Water Displacement

II. **Introductory Statement**

The student will measure the amount of water displaced by a floating object.

III. **Math Skills**

a. Estimating and predicting
b. Counting
c. Measuring

Science Processes

a. Observing
b. Recording data
c. Comparing

IV. **Materials**

One large pitcher
Scale
One measuring cup with milliliter markings
One serving dish
One apple, orange, pear, plum (these fruits may be substituted with other various objects that float)

V. **Key Question**

How can we find the weight of an apple without using a scale?

VI. **Background Information**

The amount of water spilled measured in milliliters equals the weight of water in grams, which also equals the weight of the object in grams.

VII. **Management**

1. This activity works well in a whole class situation with teacher supervision.
2. About 30 to 40 minutes should be allotted for this investigation.
3. Make sure the water is filled to the very top of the pitcher before dropping the object into it.
4. Optional: make copies of four fruits/vegetables to color, cut out, and paste as labels on student worksheets.

VIII. **Procedure**

1. Estimate the weight of each object and record on "A Sure Weigh" table.
2. Fill the large pitcher with water to the brim.
3. Place the pitcher in a serving dish so it is level.
4. Place the object you are measuring into the pitcher.
5. Pour the amount of water spilled into the serving dish into the measuring cup.
6. Record this number on the student worksheet.
7. Now measure the object on the scale and record its weight on a "A Sure Weigh" table.
8. Find the difference between both measurements and record.
9. Students will graph the amount of water spilled on the measuring cup graph.

X. **Discussion**

1. How close were you in your estimations and actual measurements? Do you think measuring an object like this is a good way? What are the advantages to measuring like this? Are there any disadvantages to measuring an object like this? What are they?

XI. **Extensions**

1. Develop an additional way to measure objects without the use of a scale.

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A Sure Weigh

Name:

Objects Tested	Prediction-weight in grams	Amount of water spilled	Actual weight in grams	Difference
Apple				
Orange				
Plum				
Pear				

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A Sure Weigh

Name:

Objects Tested	Prediction - weight in grams	Amount of water spilled	Actual weight in grams	Difference
1.				
2.				
3.				
4.				

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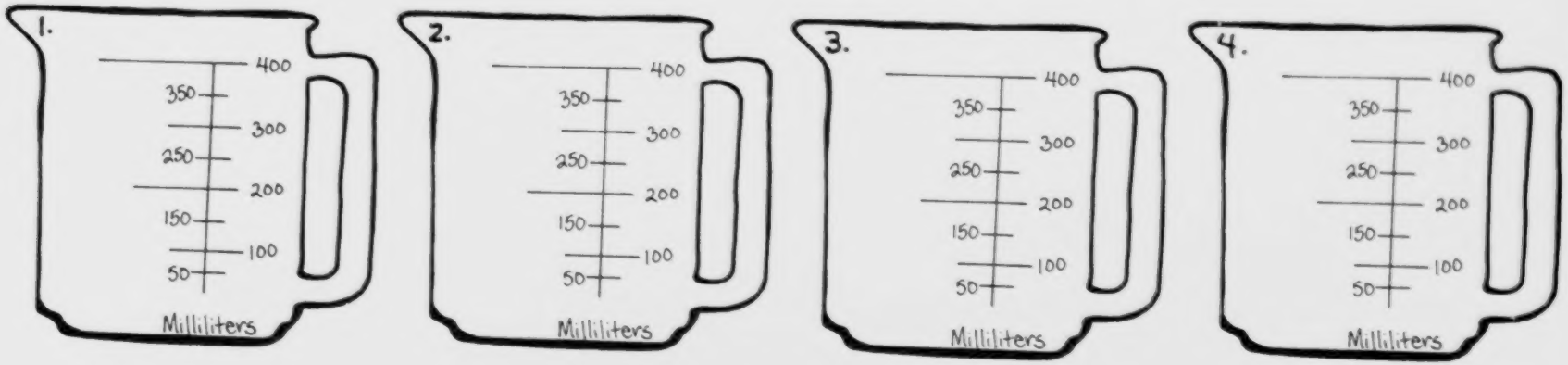
A Sure Weigh

Name:

Objects tested:

1.	2.	3.	4.



1. _____ ml 2. _____ ml 3. _____ ml 4. _____ ml

1. 2. 3. 4.

Pictures of items tested

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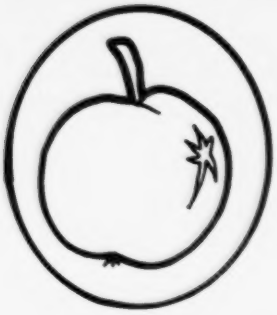
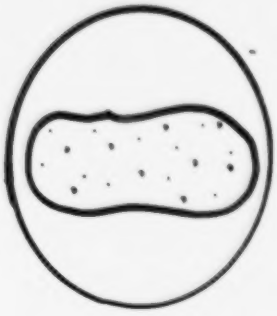
A Sure Weigh

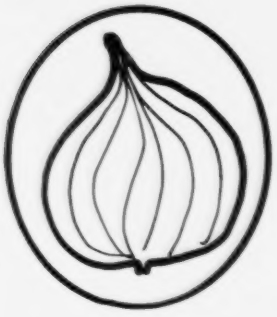
Apple



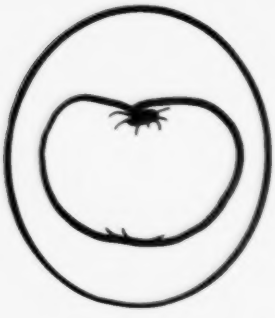
Potato



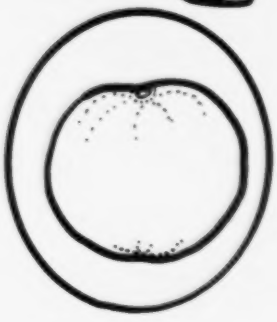
Onion



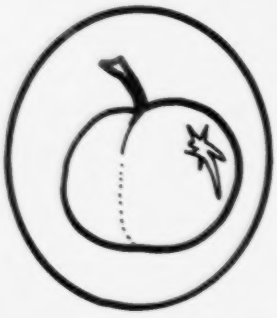
Tomato



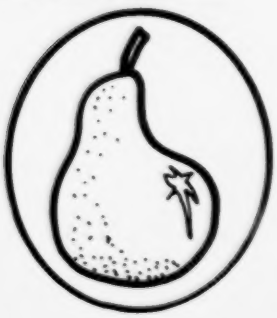
Orange



Plum



Pear



Carrot

Lemon

Choose four fruits or vegetables for students to color, cut out, and paste as labels on student worksheets.

The Incredible Edible Atom

I. **Topic Area**

Molecules

II. **Introductory Statement**

Students will learn the structure of five simple molecules by building them out of gumdrops.

III. **Math Skills**

a. Geometry
b. Counting

Science Processes

a. Observing
b. Interpreting Data

IV. **Materials**

Two pounds of gumdrops in assorted colors
One large box of toothpicks
Pencils
Crayons
Student Worksheets

V. **Key Questions**

1. What is a molecule?
2. Do molecules have different shapes?

VI. **Background Information**

All substances are made up of tiny particles called molecules. These molecules are so small that only the largest of them can be seen by an electron microscope. One drop of water is made up of billions of molecules.

All the molecules of a substance are alike, but the molecules of one substance are different from the molecules of another substance. For example, all the molecules of salt in a container are alike. But molecules of salt are different from molecules of sugar.

Molecules are made up of even smaller particles called atoms. In some cases a molecule is made up of just one atom. This is why the word molecule is often confused with the word atom. (A molecule of neon is made up of just one atom of neon.) However, in most cases a molecule is made up of more than one atom.

Scientists have discovered that all atoms are made up of three smaller kinds of particles: electrons, protons, and neutrons. Although all atoms are made up of electrons, protons, and neutrons, all atoms are not alike. Atoms differ in the number of electrons, protons, and neutrons they have, and because of this difference, there are different kinds of atoms. There are 92 different kinds of atoms found on earth. Each different kind of atom is called an element. Chemists also define an element as a simple substance that cannot be broken up into anything simpler by ordinary chemical reactions. Elements are often called "the building blocks of matter." All substances are made up of different combinations of these 92 natural elements and a growing number of man-made elements.

The molecules of methane and calcium carbonate are three dimensional, but at this point it is not necessary or appropriate to expect primary children to comprehend these differences completely.

VII. **Management**

1. At least 50-60 minutes should be allotted for this investigation.
2. If this much time is not available -- the investigation may be completed in another session.
3. This investigation may be carried out in small groups of 4 to 6 or with the entire class. Students may work alone or with partners.
4. It saves time to have all the gumdrops sorted out by color before starting the investigation.
5. Determine the colors of gumdrops to be used for each element. Usually a bag of gumdrops has five basic colors. Each student will need a minimum of:

   4 hydrogen
   3 oxygen
   1 each - nitrogen, carbon, and calcium

   or

   a maximum of 9 hydrogen
   6 oxygen
   3 carbon
   1 nitrogen
   1 calcium

   If you don't have enough gumdrops, students may take apart molecules and reuse the gumdrops in another molecule.

VIII. **Procedure**

1. The teacher will introduce the vocabulary words: molecule, atom, element, and chemical bond.
2. The teacher will introduce the student worksheets to the students, explaining the set-up and atom names.
3. The students will take crayons and complete color chart worksheet before building models of molecules.
4. The students will color the atoms of the water molecule with assigned colors, and will write the chemical symbol for water in the box.
5. The teacher will build a water molecule with the entire class.
6. Each student will take two hydrogen "atoms" and one oxygen "atom" and build a water molecule.
7. Continue with this procedure to make the other molecules.
8. Ask students to create their own molecule.
9. The students may trace each completed molecule on a sheet of white drawing paper and color to match the model. Label each drawing.
10. Enjoy eating your molecule models.

X. **Discussion**

1. How many atoms make up each molecule?
2. How does that affect the shape?
3. What molecule is the hardest to make?
4. What molecule is the easiest to make? Why?

XI. **Extensions**

Create other molecules by looking at pictures of their structure.

XII. **Curriculum Coordinates**

P.E.

Encourage the students to become "human molecules" and experiment building on their own.

Language Arts

Encourage the students to design a new molecule. Name it. Describe it. Illustrate it.

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	Candy Color	Atom
H	_____	Hydrogen
O	_____	Oxygen
C	_____	Carbon
N	_____	Nitrogen
Ca	_____	Calcium

Color the gumdrops, following directions.
Write the name of the color in the blank.

The Incredible Edible Atom

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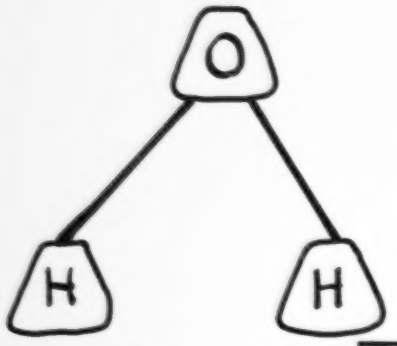
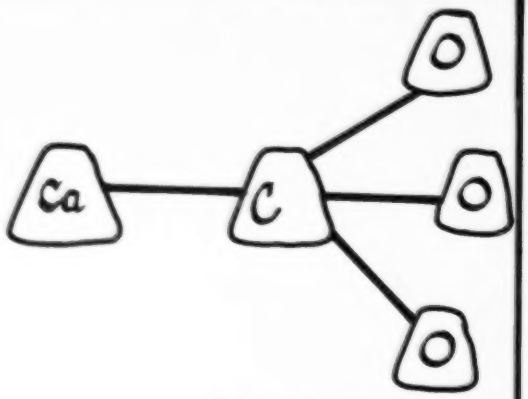
Molecule Models

Name:

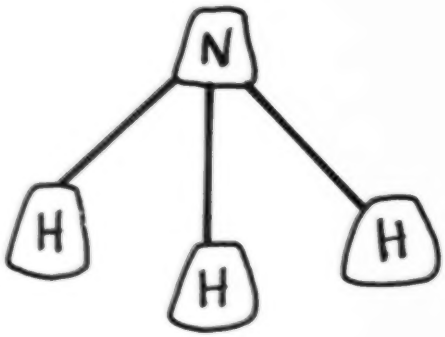


water

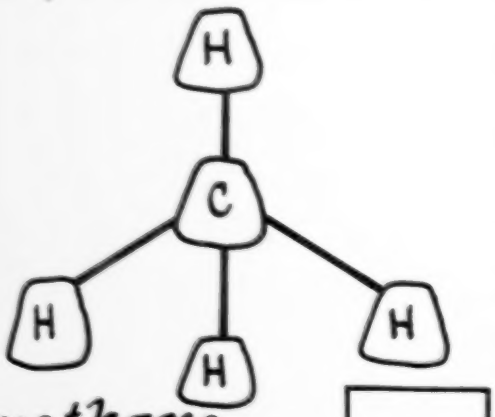


calcium carbonate

carbon dioxide



ammonia



methane

Make your own molecule:

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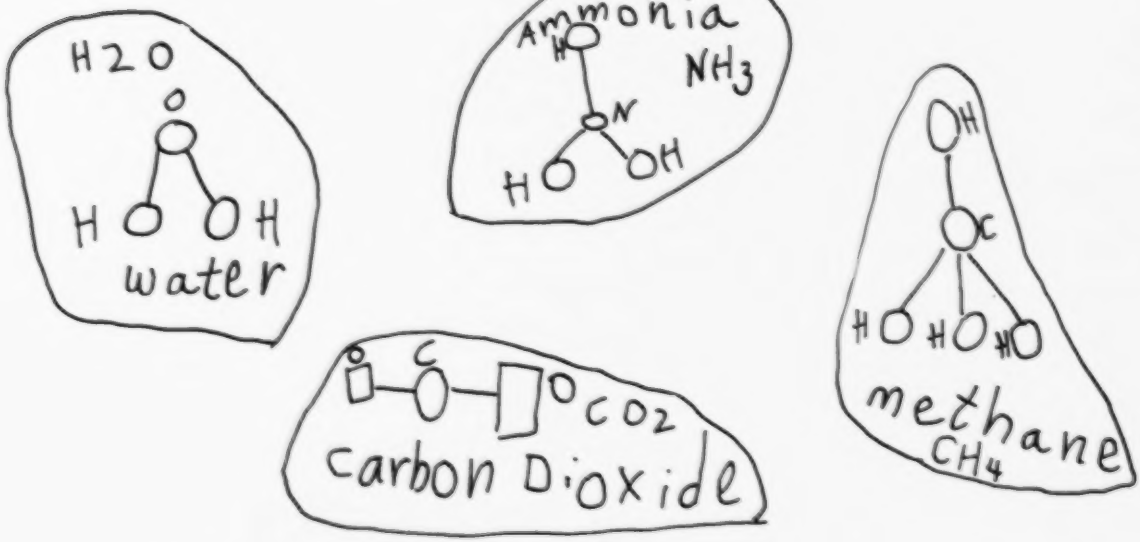
The Goat's Atom Mill

Tune: "The Hokey Pokey"
Words: Al and Jean Krueger

I have a goat named Bill, he runs an atom mill;
He mixes atoms to make a molecule.
There are several kinds of atoms that he tends to use
To make up his molecule.

I have a goat named Bill, he runs an atom mill;
And when he wants to make a water molecule
He takes two parts of hydrogen and one of oxygen,
And out comes a water drop.

I have a goat named Bill, he runs an atom mill;
And when he wants to make an ammonia molecule
He takes three parts of hydrogen and one of nitrogen,
And out comes ammonia smell.



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Lucky Numbers

I. **Topic Area**

Estimating and Counting

II. **Introductory Statement**

Students will estimate and count the different shapes of Lucky Charms cereal.

III. **Math Skills**

a. Counting
b. Graphing

Science Processes

a. Observing
b. Recording Data
c. Estimating

IV. **Materials**

Lucky Charms cereal-1 box
3 oz. paper cups enough for each student
Yellow and green crayons for each student
Napkins
Student worksheet for the graphing

V. **Key Question**

How many of each different items are in your cup?

VI. **Background Information**

The different shapes in this cereal are cereal, moons, hearts, shamrocks, diamonds, and suns. Other cereals could be substituted-Tricks, Pac-man, etc.

VII. **Management**

1. It's better to do all the estimations first, then the actual count.
2. This activity takes 15-20 minutes.
3. This activity will work with small groups of 4-8. This could be done as a whole class activity.

VIII. **Procedure**

1. Have the cups already filled with the cereal.
2. Discuss the items that will be estimated.

IX. **What the Student Will Do**

1. Each student, using their yellow crayon, will graph their estimations for the cereal part, moons, hearts, diamonds, shamrocks, and suns.
2. After estimating, the students will pour the cereal out of the cup and place it on the napkins.
3. They will count only the cereal part, putting the pieces back in the cup as they count.
4. Graph their count using a green crayon.
5. Continue with the same procedure for the moons, hearts, diamonds, shamrocks, and suns.
6. Eat them!

X. **Discussion**

1. Were you surprised by the actual count?
2. Which shape had the most pieces?
3. Which shape had the least pieces?
4. Did everyone have the same answer?

XI. **Extensions**

1. Comparison of estimations and actual counts.
2. Getting a total of each item for the whole box.
3. Older students could do a ratio study.

XII. **Curriculum Co-ordinates**

Language Arts

Make Leprechaun footprints and have the children write about them.

Art

Making shamrocks, Leprechauns

Health

The Food Groups

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Lucky Numbers

①Color in your estimate (?) with yellow. ②Count & color answer (A) with green.

Cereal

	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160
?																
A																

Purple Horseshoes

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
?																
A																

Yellow Moons

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
?																
A																

Pink Hearts

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
?																
A																

Green Shamrocks

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
?																
A																

Blue Diamonds

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
?																
A																

Orange Suns

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
?																
A																

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I. **Topic Area**

Making Butter

II. **Introductory Statement**

Students will observe the change in cream as it is turned to butter.

III. **Math Skills**

a. Measurement
b. Graphing
c. Estimating

Science Processes

a. Observing
b. Estimating
c. Gathering & recording data
d. Applying & generalizing

IV. **Materials**

Jars - 6 the same size (12 oz. well)
Whipping Cream - 2 pints produce enough butter for at least 35 students.
Knife
Napkins or paper towels
Crackers (at least one per child)
Class chart
Tape, paste or glue
Butter markers (see ditto)

V. **Key Question**

How many shakes do you think it will take to turn the cream into butter?

VI. **Background**

1. Cream turns to butter quicker if it's at room temperature.
2. Make sure to fill the jar half way for best results.
3. 10 to 16 oz jars work the best.

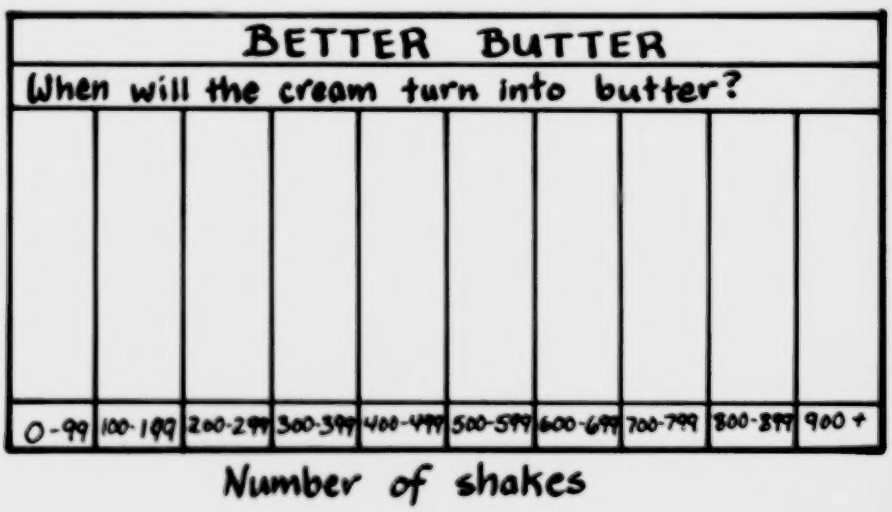
VII. **Management**

1. Have students work in groups of 4-8.
2. Allow at least 40 minutes for the entire activity so that each group may finish completely.
3. Have chart made ahead of time.
4. Have butter markers cut out before starting lesson.

VIII. **Procedure**

Ahead of time:

1. Make class chart (see example below)



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Classtime:

1. Ask students if they know where butter come from.
2. Explain that butter is made out of cream.
3. In front of the class, pour cream into one of the jars (½ full). Screw top on tightly.
4. Explain to the class that they are going to make butter by shaking the jar and they are to keep track of how many shakes it takes.
5. Explain that each child will shake the jar 10 times and you will put a tally mark on the board for every 10 shakes. After you mark the tally, the jar is passed to the next child.
6. When the cream is turned into butter add up the tally marks. Do this as a class, counting by 10's. Circle every 10 tallies as groups of 100. Find out how many shakes it took.
7. Give each child a butter marker. Ask them to think about how many shakes it takes to make butter if we were to do it again. Have them write their name and their guess on their butter marker.
8. Students then come up and stick their marker (using the tape, paste or glue) on the chart in the appropriate column.
9. Divide the students into their groups. Give each group their own jar filled half way with cream. Give each group a sheet of paper to keep tally on.
10. Have students in each group, take turns shaking the jar ten times and marking their sheet with a tally.
11. As groups finish have them add up their tallies. Talk about how many shakes it took each group and how close their guesses were.
12. Drain off excess liquids and enjoy the butter on crackers.

XI. Try this experiment with different size jars to see if it makes a difference.

XII. Curriculum Coordinates

Art

Cow puppet
Draw a picture of a cow in its natural surroundings.
Draw a secuence picture of where butter comes from - Cow-Dairy-Store-Home.

Creative Writing

Write stories as the cream and describe what is happening to you.

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TIGHT SQUEEZE

I. **Topic Area**

Water Pressure

II. **Introductory Statement**

Students will compare the different distances that water travels under various pressures.

III. **Math Skills**

a. Measurement
b. Counting
c. Graphing

Science Processes

a. Recording data
b. Observing
c. Comparing
d. Controlling variables

IV. **Materials**

Paste
Pencil
Scissors
Glue Stick
Masking Tape
Straight Pin
Student Pages
Crayon-1 color
Rubber Bands-9
Book/Clip Board
Container-Water
Construction Paper
3 Chairs-same height
Nail-approximately 5 cm long
9-12 Yard Sticks/Meter Sticks
Phillips Screwdriver-17½ cm long
Aluminum Foil-9 to 12 pieces
3-9 Plastic Squeeze Bottles-approximately 4 8 oz. with tops.

V. **Key Questions**

How far will the water travel when you use a soft squeeze on the bottle in comparison with a medium or hard squeeze? Will water travel further when you have a large hole or a small hole in the top of the bottle?

VII. **Management**

1. These activities will take one three hour session of three one hour sessions.
2. Using a clear area of the playground set up three squeeze stations as picture in Figure 1.

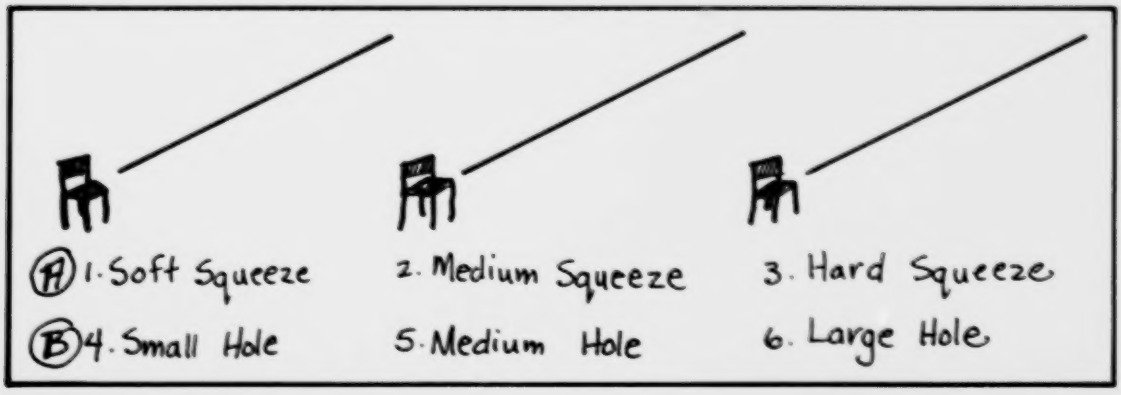
   All chairs should be the same size and the plastic bottles should rest on the seat of the chair while being squeezed.
3. This activity may be used with the whole class or small groups.
4. Bottles can be purchased at grocery, drug, or department stores. Check your beauty shop.
5. A soft plastic bottle will lose its shape when it is squeezed hard and may need to be reshaped.
6. If plastic squeeze bottle does not have a hole in the lid you can punch a hole with an ice pick through the lid.
7. Aluminum foil will be used for step 2 of this experiment. The foil may tear and need to be replaced after a few squeezes.
8. If you have more than three plastic bottles you can have extra bottles ready at each chair station.
9. Divide students into groups of three. Have one student to squeeze the bottle, one to measure, and one to record the distance.

VIII. **Procedure**

Step One:

1. Students estimate distance water will go when bottle is squeezed softly, medium, and hard with the top that came on it, and record on worksheet.
2. Give each group a squeeze bottle and go out to prepared area.
3. Have group take turns squeezing their bottles on the chair and recording measurements. They should do 3 measurements. One when the bottle is squeezed softly, one squeezed medium, and one squeezed hard.
4. (Optional) Students graph results.

   Note: To control the one variable of squeeze strength the students should always use the same bottle with the same size hole.



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Step Two:

1. Before going out, teacher prepares squeeze bottles
   a. 1 with small holes. (pin)
   b. 1 with medium hole. (nail)
   c. 1 with large hole. (Phillips screwdriver)
   d. Do this by punching a hole in the aluminum foil and attach to the bottle with a rubber band.
2. Students estimate distance water will go when using small, medium and large hole bottles.
3. Students will squeeze one bottle at each station: Station 1 small hole, Station 2 medium hole, and Station 3 large hole, using medium strength squeeze for each station; record measurements.
4. Students graph results.

   Note: To control the one variable of hole size make sure the students understand they must always squeeze with the same strength.

Step Three:

"The Squeeze Contest"

1. Each student group prepares a bottle in the way that will give them the longest shot. They choose the size hole they want and punch the aluminum foil and attach with a rubber band.
2. Go out to prepared area and each group takes their turn squeezing their bottle from their chair. They are to choose a soft, medium or hard squeeze.
3. Measure results and record on contest record.
4. Return to classroom and discuss results, and make a class graph of contest results. Each group cuts out a strip of construction paper the length of their shot. Place on board.

X. Discussion

What type of squeeze gave the longest shot? Why?
What type of a hole gave the longest shot? Why?
Why did the winning team get such a long shot?

XI. Extensions

1. Use soap in the water, or some other solution to see if it will change the shot distance of the bottle.
2. Use other kinds of materials in place of foil on top of the bottle, and put in holes of various sizes.
3. Use bottles of a bigger or smaller size, or a different size hole, even squirt guns or squirt lever bottles.

XII. Curriculum Coordinates

Art

Create a picture either on colored construction paper, cement, blacktop, or dirt with squirts of water.

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TIGHT SQUEEZE GRAPH

(in centimeters - cm)

Name:

	Ⓐ TIGHT SQUEEZE			Ⓑ BIG SHOT		
	① Soft	② Medium	③ Hard	④ Small	⑤ Medium	⑥ Large
Estimate ?						
Actual						

cut

Contest Certificate

for

TIGHT SQEEZE

Group Members _____

_____

_____

Hole Size _____

Squeeze _____

Distance _____ _____ Place

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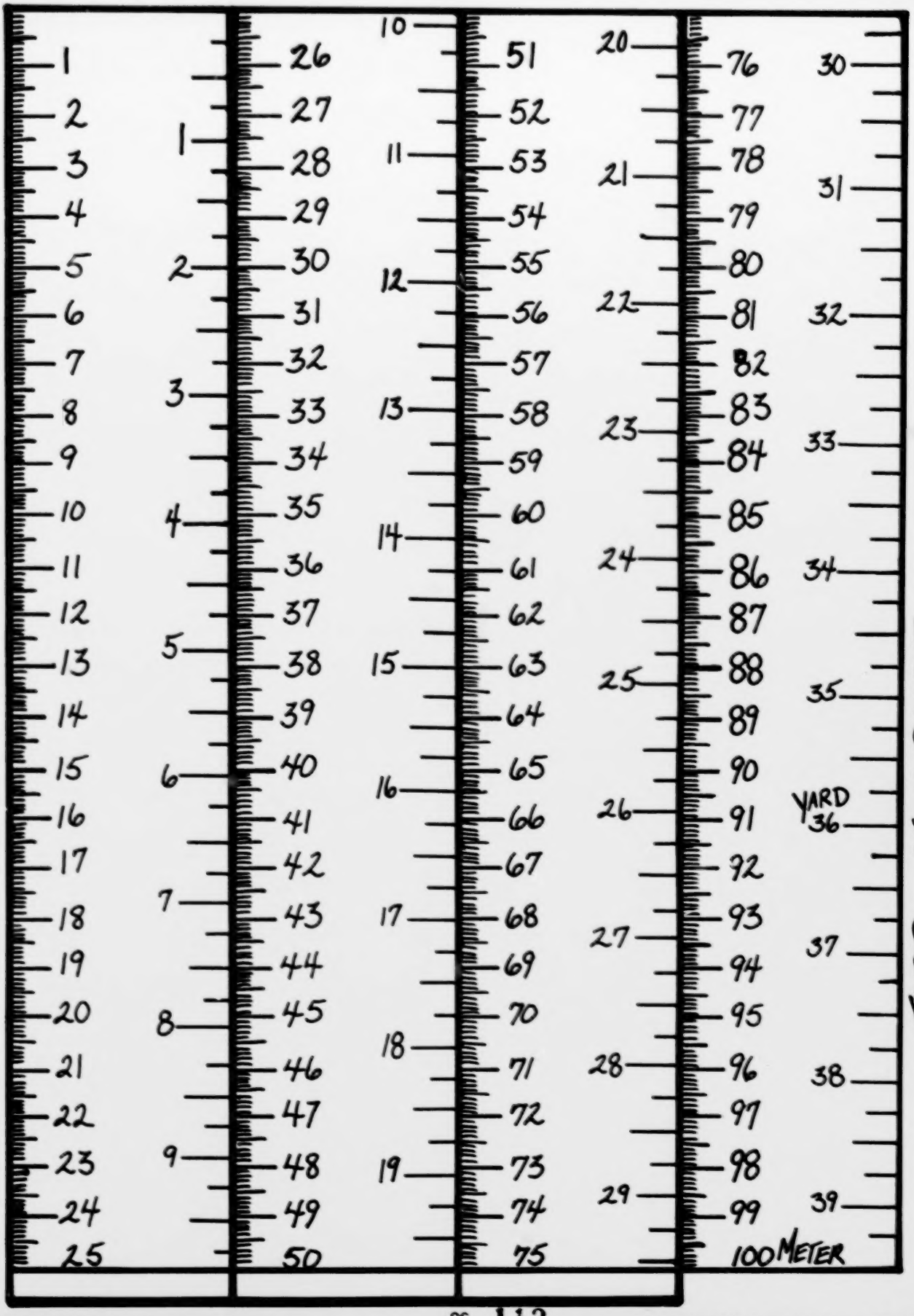
TAPE MEASURE
YARD
36
METER
100